THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCI. No. 2211.] LONDON, SEPTEMBER 26, 1905. [57TH YEAR. PRICE 6d.

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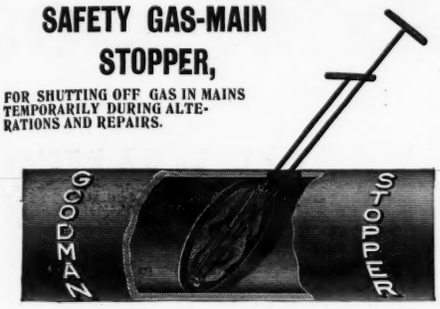

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TO THE EDITOR OF ENGINEERING.

SIR,—Some years ago we attached forced draught and special fire-bars to our two Lancashire boilers, with the object of burning coke dust. The load has grown, and last week I had the water and fuel carefully checked, with the following results:—

Water used in boilers from Dec. 9 to Dec. 16, as per Corporation meter .	79,300		
Fuel used from Dec. 9 to Dec. 16: Coke	£	s.	d.
dust—41 tons 4 cwt., at 1s. 11d. .	3	19	0
Washed slack—15 tons 17 cwt., at 6s. 6d.	5	3	2
	£9	2	2

This works out at a fraction under 2s. 4d. per 1000 gallons. Can this result be beaten? I may add that the water-feed to the boilers is heated by the exhaust steam from the engines to 200 deg.

Yours truly,
C. D. LENG.

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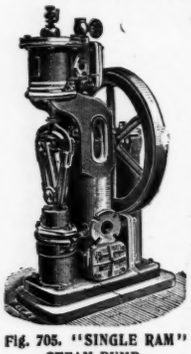

Fig. 705. "SINGLE RAM" STEAM-PUMP.

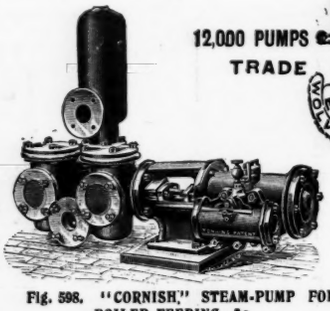

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

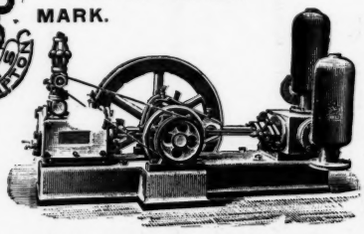

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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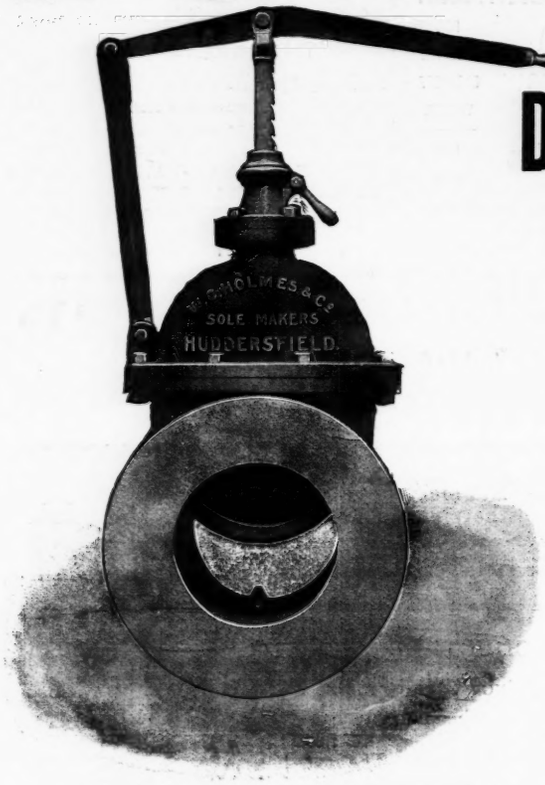

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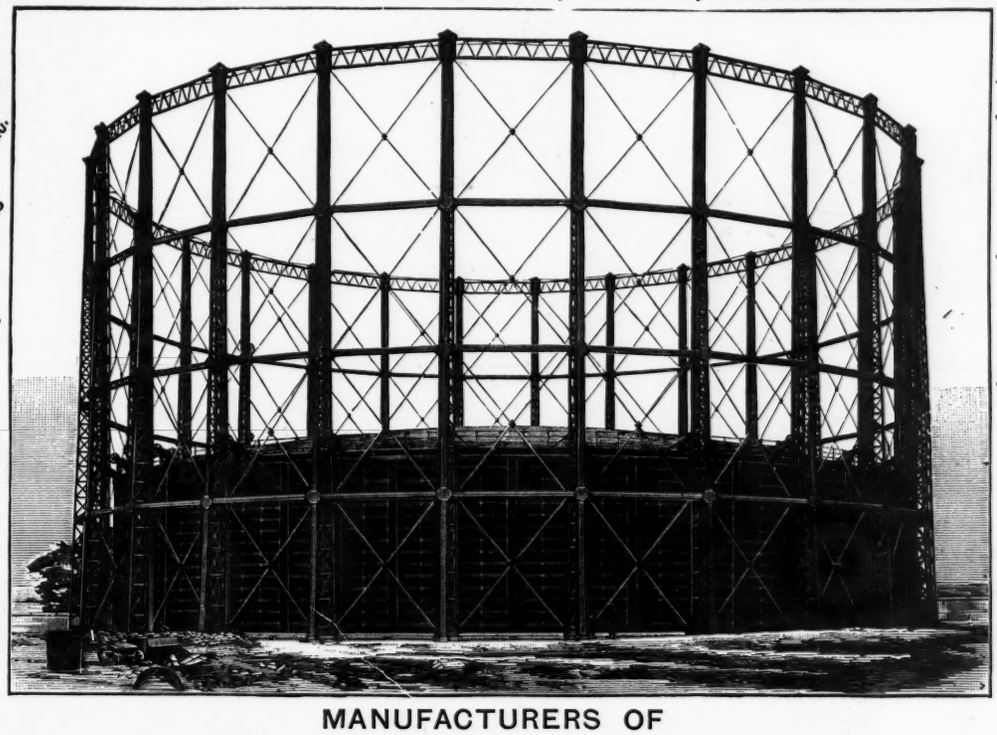

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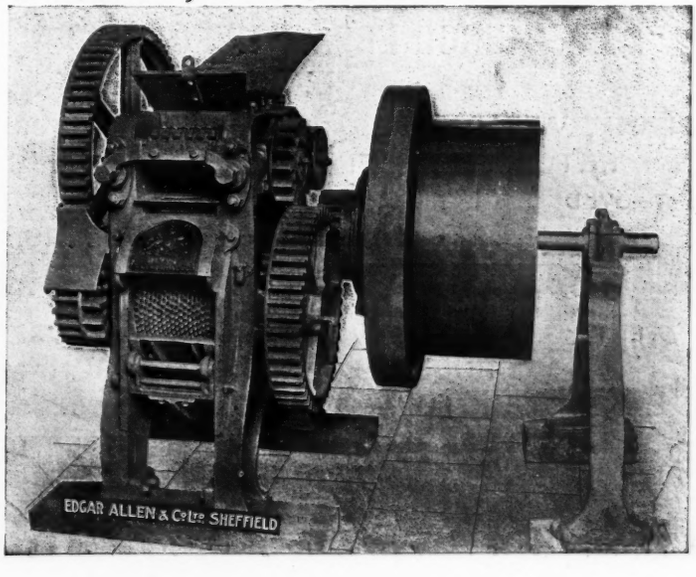

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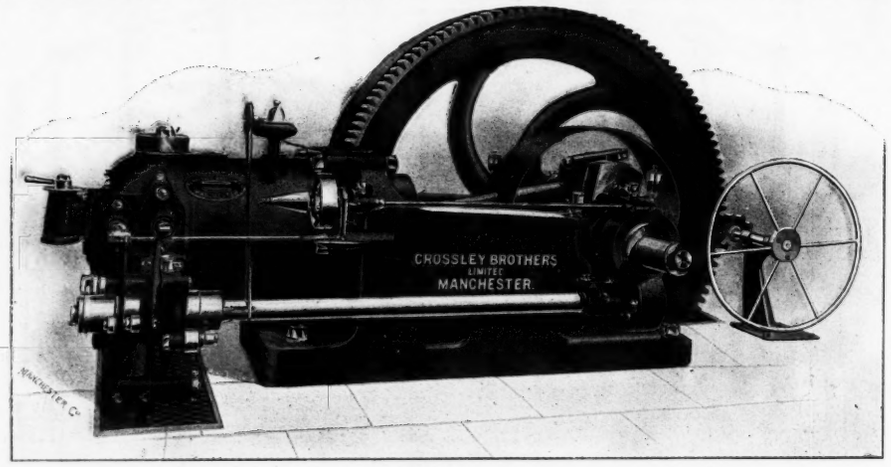

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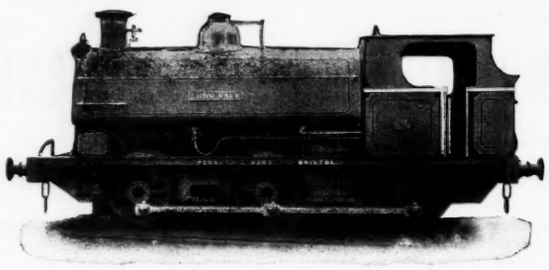

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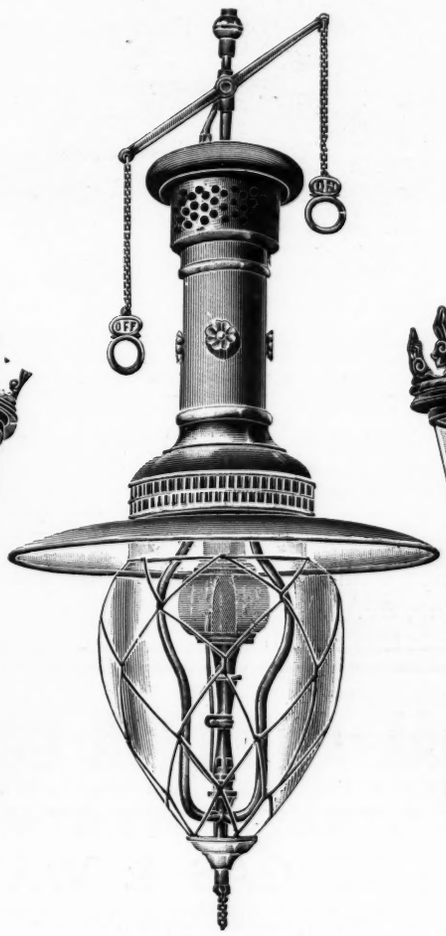

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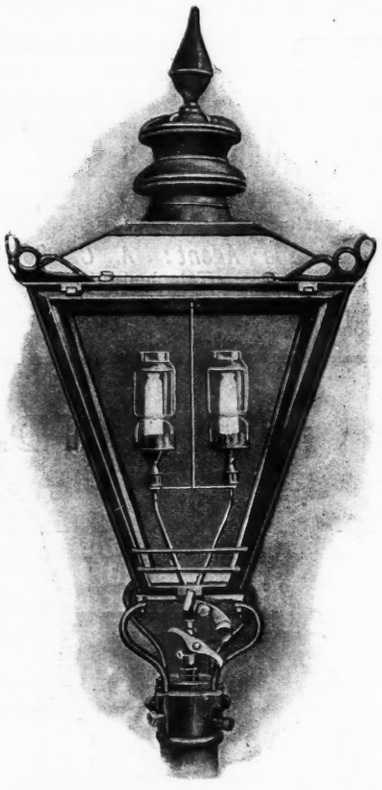

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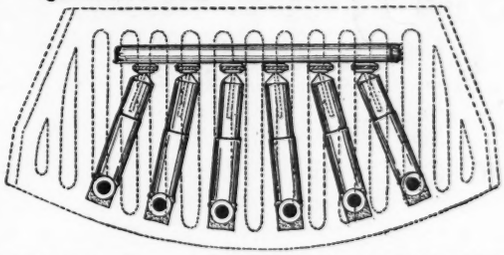

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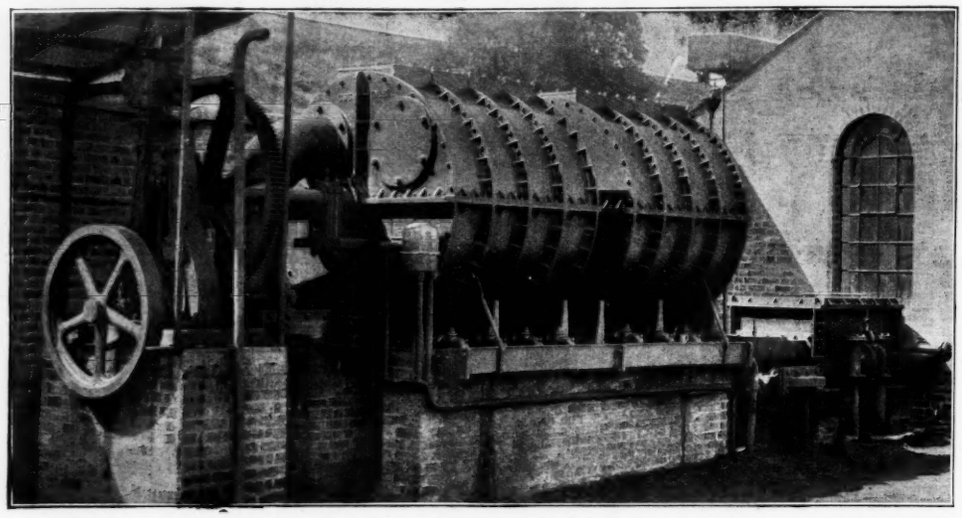

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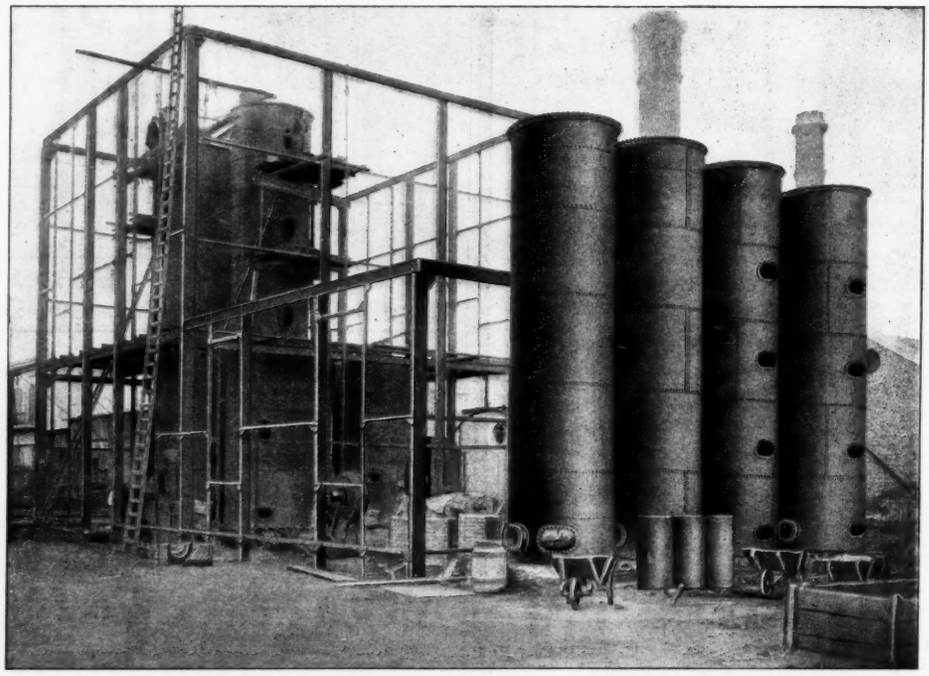

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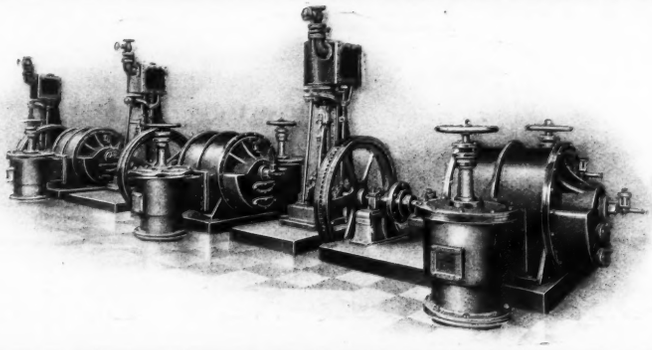

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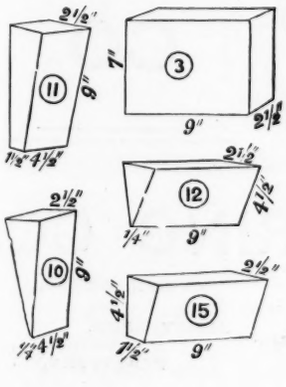

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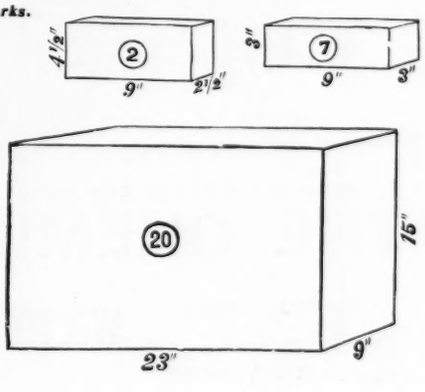

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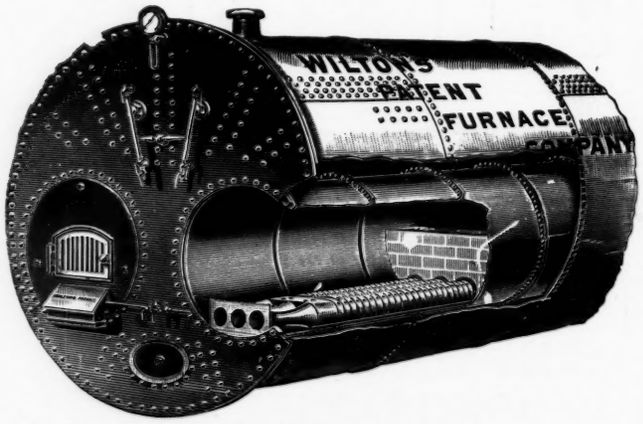

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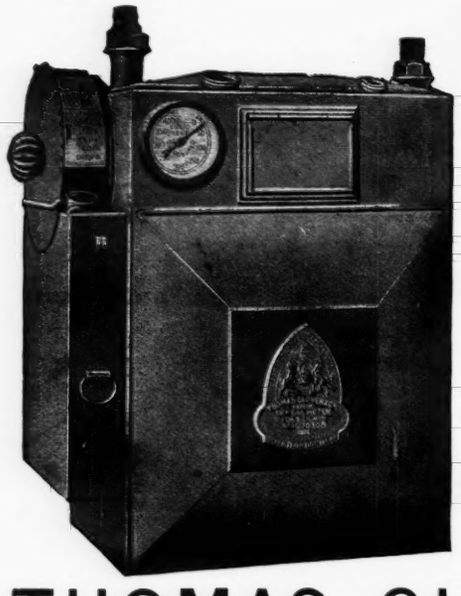

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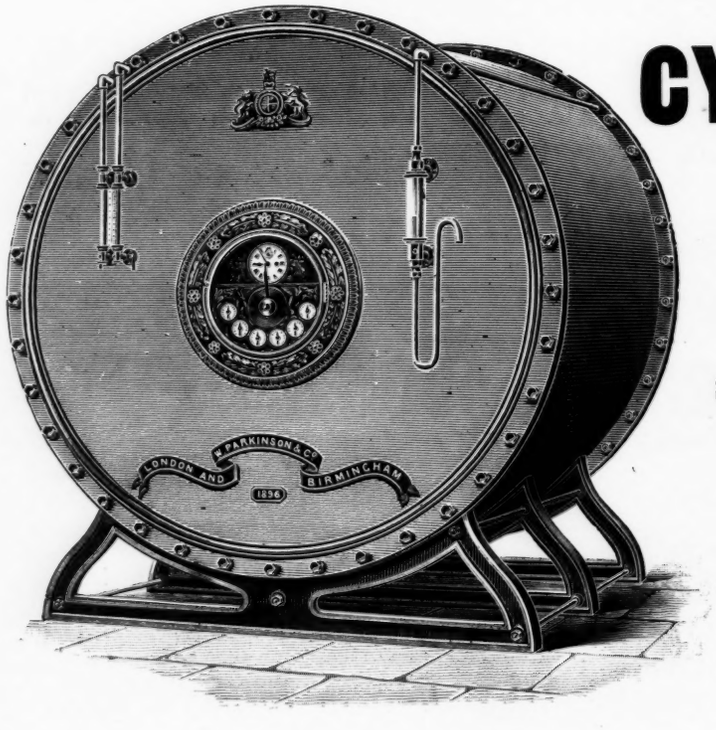

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EDITORIAL NOTES—GAS, &c.

Eastern Counties Gas Managers' Association—The Blending of Producer and Coal Gases.

DISTANCE did not debar a large proportion of the members of the Eastern Counties Gas Managers' Association from visiting Cleethorpes for their half-yearly meeting last Thursday. For this, there is no necessity to search for reasons, as they are palpable to all who keep themselves informed of the doings in the active quarters of the gas profession. At Cleethorpes, under the engineership of Mr. E. J. Brockway, much of interest has happened and is happening, both in the methods of gas production and in the development of the business in the district. The appetites of the gas profession have been sharpened by what has been reported in these respects; and it was only natural that those who were able to avail themselves of the opportunity should desire to make a personal investigation. We need not go into details, other than are to be found in our report in another part of this issue. There it will be seen that the outstanding features of the works which claimed attention were the introduction of blue water gas from the Dellwik plant into (according to the percentage used) the foul main or the retorts, and the setting of the Settle-Padfield vertical retort in course of erection. Combined with these attractions was the fact that Mr. R. G. Shadbolt, of Grantham, is the President for the year; and the members are well aware, from past experience, that it is part of Mr. Shadbolt's nature to be original. Therefore his address was anticipated with especial delight, and, as the event has shown, whatever the members had expected, their expectations were exceeded. The originality took a dual course, neither of which, however, has our complete sympathy. The first may be disposed of at once. Among the President's gifts is that of rhetoric; and he, on this occasion, shook off the fetters of precedent, and delivered his address extemporaneously. From the journalistic point of view, this, of course, does not meet with approbation; and, with all deference to Mr. Shadbolt, we do think an account of technical investigation that is to be permanently recorded, and will henceforth be critically examined the world over where gas engineers are to be found, merits embodiment in premeditated, well ordered, and concrete form. The compliment, however, must be paid the President that he came out of his unique performance with fresh honours. The address was an eminently practical one; and its chief theme was the problem of the day as to how best to meet the varied requirements of consumers in respect of the quality of gas to be supplied. Mr. Shadbolt—and herein is the second line of originality in his address—has pursued his own independent way in this matter; and his experiments, succeeded by actual working, have taken the direction of blending with his coal gas the best producer gas obtainable from his settings.

In the forepart of the address, there are matters which we must reluctantly pass over. But there is one preliminary point to be noticed. The great desirability of investigation of the various problems that confront the gas manager of the present day is freely acknowledged; and it is generally felt that such investigation should be conducted under the auspices and the direction of the Institution of Gas Engineers. What renders this desirable is that, as observed by Mr. Shadbolt, the average gas manager has not the necessary facilities for real research work. At the same time he very justly pointed out that comparatively small undertakings can most readily put into practice any scheme which seems likely to be of service, and prove its practical utility, while larger undertakings are under the necessity of depending more or less upon laboratory practice. Much, no doubt, depends upon the man. There are some who, in the enjoyment of ample facilities, prefer to tread the beaten track, and theirs may prove a safe, if uneventful, course. Others again, with comparatively slender resources, endeavour to stake out a path for themselves; and they are to be commended for this, so long as it is evident that their efforts are directed by prescience of the goal to be attained. It sometimes happens, however, that the problem to be solved is but imperfectly comprehended, or is lost sight of, through the development of some ulterior issue. We do not say that this is the case with Mr. Shadbolt; but we cannot but deprecate his method of diluting his coal gas as an economical fallacy, and one not likely to serve in any material degree the cause of progress.

It is quite evident that Mr. Shadbolt appreciates to the full the fast diminishing value—for its own sake—of illuminating power, notwithstanding the fact that in Grantham the flat-flame burner is still by a very long way the dominant factor. But he does not seem to have realized the fact that, in place of illuminating power, calorific value has become, or is fast becoming, of chief importance; so that the real problem to be solved is: How to reduce illuminating power without proportionately reducing calorific value. Attracted, apparently, by the increase in volume which he gains by ingeniously introducing producer gas from under the retorts into his foul main, he does an injustice to the consumers of his gas for heating or for power purposes by materially reducing the calorific value of their gas. They are just as much entitled to compensation for this as if the illuminating power were reduced by 2 or 3 candles below the parliamentary standard. We quite admit the reality of all that Mr. Shadbolt says as to the suitability of his blended gas for heating purposes or for motive power, which in point of cleanliness is doubtless improved by the comparative absence of carbon. It may also be conceded that gas having a calorific value of 500 B.T.U. is good enough for all practical purposes; and that to be enabled to supply such gas at a really cheap rate is a consummation devoutly to be desired. But on the financial aspects of the subject Mr. Shadbolt is silent, except that he says he is satisfied with them; and, from the point of view in which he appears to regard this question, one has little difficulty in realizing that this may be so. The weakness of the scheme, however, is that it is only another attempt to dilute coal gas as far as possible without detection by the ordinary consumer, and, practically, without regard for its calorific value. This is very far from what is meant by "stretching out" the gas so as to comply with the requirements of low illuminating power coupled with comparatively high calorific value. Such compliance can only be legitimately effected by improved methods of carbonization resulting in a higher yield of gas per ton of coal carbonized. It is satisfactory to know that efforts in this direction are being rewarded by good results; and it is to be hoped that these will not be diverted from such a promising field of labour by meretricious methods such as that so fully described by Mr. Shadbolt. We say this with all respect for his ingenuity and resource, which were the admiration of the hearers of his address.

There were no papers read at the meeting; and really they would have been superfluous, as the President's address in itself offers such an amplitude of technical food, that with more the members would have been satiated. One thing, among other business, the members did was to ratify the recommendation of the Committee that, following the lead of the Manchester Institution, Commercial Sections should be established in connection with the Association. In the northern part of the district, the scheme has already been tentatively in operation; and so beneficent are the effects that the plan is to be extended throughout the Association's territory. There is bitter complaint from some of the members as to the disastrous effect upon certain of their undertakings by the coke dealings of at any rate two large places bordering the Eastern Counties district; and it is hoped that from the sections which the Committee have been instructed to bring into working condition, good in many directions will accrue, and, in not the least respect, that the severity of this coke competition will be moderated.

Exhibitions—Local and Otherwise.

THE magnificent Gas Exhibition at Earl's Court—of ten months or so since—has left its impress in more ways than one. Its educational effect on the public, and the extension of the conversion of popular opinion in regard to the actualities of gas performance, are of the first importance; and among the secondary effects is the permeation through the gas industry of an understanding of what is required to minister to the public taste in the matter of exhibitions of the kind. It cannot be expected that the great show at Earl's Court will be repeated, except at distant periods; but the lines of the exhibition afford an exemplar of what even local exhibitions should be. It is to local exhibitions that the time is opportune to direct notice. "The old exhibitions "served their day," said Sir W. H. Stephenson, the Chairman of the Newcastle and Gateshead Gas Company, at the opening the other day of the exhibition—a miniature of that at Earl's Court—now being held in the great Northumberland city. That is true; and therefore it would ill become us to be hypercritical over them now. But in regard to them, the magnetism of novelty failed; and torpidity set in. A collection of the gas cookers and fires of a few makers, with cookery lectures, and a display of just sufficient lights to answer the purpose of illuminating the place of exhibition, fulfilled for a time the purpose of developing the use of cooking-stoves. But the times have changed; and the change was partially brought about by the exhibitions themselves as they served their object. The gas cooking-stove has become popular; and it is regarded in all well-appointed houses as a necessity, not only during the summer, but during the winter. The gas-cooker in the old days, when it was generally looked upon as a useful adjunct to the fitments of a kitchen for summer use, set the custom of holding local exhibitions in the spring; but the custom is wrong to-day, owing to the altered circumstances. It is, for obvious reasons, lighting and heating upon which educational work among the public is now specially required; and the use of gas for cooking, power, and other domestic and industrial operations, can be cultivated at exhibitions held any time most suitable for lighting and heating. That time is the present season of the year, and onwards during the winter.

Suitability of time is one consideration; and the other is the form that an exhibition should take. An exhibition of a peddling character is of no earthly use now. This is a fact that a certain type of exhibition of the past has completely demonstrated. Gas-stoves alone have lost their power to attract and delight; and what the public want in order to draw them now is something partaking of a spectacular character, combined with instruction as to how they can get the greatest value, no matter the purpose of use, from the gas they purchase, as well as with the supporting influence of entertainment. In Newcastle, Croydon, Grantham, and perhaps other places, the Gas Engineers diagnosed, before Earl's Court, the failures of the former class of exhibition and the remedies; and they proved the correctness of their diagnosis by demonstration. Just as the Earl's Court Exhibition was an expansion of the latter displays in those towns, so must future local exhibitions be that of Earl's Court on a small scale. With proper organization, this can be done, as is proved by what is now taking place in Newcastle; and, it is expected, will be shortly seen in Newport (Mon.), and later on in Dublin. Of course, these are all places of considerable importance and scope; but, again, just as they can repeat Earl's Court on a much lessened scale, so can the gas suppliers of smaller towns—if they will only set themselves the task, if the preservation and development of their own business appeal to them—copy the features of those exhibitions on a scale fitted to their several needs. We have said that it is spectacular effect, instruction, and entertainment that draw to-day. Earl's Court supplied not only the model, but the evidence that we have at command in the gas industry all that is requisite for meeting the public taste. High-power lighting inside and outside a building is the first attraction; and inside, in furnished rooms and shop-windows (in the provision of which for the advertisement local traders will assist), the beautiful artistic fittings that are to be seen now in every gas undertaking's show-room, the inverted lights both large and in the bijou form, and the ordinary incandescent lights, from the type of the large Kern down to the Gem size, with samples of the systems of ignition and extinguishing from a single point, and with the beautifully cased examples of efficient gas-fires, give all that is necessary to demonstrate interior lighting; a kitchen, with its ordinary appointments and a gas cooking-stove, will bring upon itself more notice than a profusion of cooking-ranges of various types; the kitchen gas range and a bath-room will show conclusively that rapid water-heating is possible by gas at any time; a small apartment will demonstrate the usefulness of gas in a laundry; and a workshop, the industrial uses of gas. Lectures, demonstrations, and music are the necessary accompaniments. This does not exhaust the scheme for a local exhibition; but it shows that local exhibitions are possible without going to excessive expense in bringing together a large collection of appliances. It is certainly not bulk, in this case, that tells.

The question of expense suggests a word on behalf of manufacturers. It is no secret that they incurred a large outlay in connection with the Earl's Court Exhibition; and it cannot be expected that, if the local exhibition on the new lines is to become general in these times of strenuous competition with gas, they can assist at them all on a lavish scale. If their co-operation is required, then the gas undertakings must take a generous view of the proportion of the expense which they themselves must bear. In the consideration of the question of expense, it is a wrong view to take that, as the manufacturers derive benefit through the greater demand for their goods from the development of the gas business that results from an exhibition, they should be made the pack-horses for the exhibition expenses. There are limits to the benefits which accrue to the manufacturers—limits imposed by severe competition among themselves. They have to supply the goods, the cost of their transit, and the expense of an attendant; and in any one place these expenses alone amount to quite a sufficient bid for the additional business they are likely to derive from their enterprise in that one town. The original reason for the gas exhibition is the promotion of the interests of the local gas undertaking; but this is frequently lost sight of in discussing who shall bear the costs. From the profits realized by the increase in the consumption of gas *per se*, and from the augmented consolidation of the gas business of the local undertaking which the exhibition brings about, the manufacturers do not take a part; and therefore the least the local undertaking can do is to carry the expense of providing a suitable place for an exhibition, of labour, pipes, and gas to an agreed quantity. There are also other incidental expenses; but regarding the exhibition as a speculative enterprise from which, it is hoped, mutual advantage will ensue, then there should be a fair apportionment of expenses—liberality resting with the gas company or committee.

On the new lines, the local exhibition should be very successful in fulfilling its purpose—keeping to the front the fact that it is lighting, power and industrial use, general heating, and water heating, that require prominent attention for the time, with instruction in the use and care of these appliances and gas cooking-stoves. These were chief features at Earl's Court; but, in part, the exposition and the useful work done there need repetition in localities from which only a favoured few witnessed the sights of nearly a year ago. The display then made, and the generally recognized influence it had upon the public mind, have no doubt accelerated the desire of the electrical industry to try to convince the public, by the show opened yesterday at Olympia, that it is all a mistake that superiority in cost and efficiency is on the side of the gas industry. We recognize to the full the operative power before any tribunal of the last word; and that is an advantage the Olympia exhibition may transiently give to the electrical industry. Some of our electrical contemporaries last week were imitating those stupid birds who get out of their reckoning, and make night hideous before cock-crow. One of them went to the extent, in talking of the exhibition popularizing the use of electricity, of saying: "Let us hope that this purpose will be accomplished to the "full. Then a fresh impetus will be given to the various "sections of our industry; and gas engineers will get back "to the paths of humility along which they wandered "vacantly before the holding of the Earl's Court Exhibi-"tion." These latter are words and words only, used merely to disguise their true feelings and knowledge. If vacant wandering along "paths of humility" before the Earl's Court Exhibition created the prosperity of the gas industry, and laid by the heels the electric lighting industry, then we shall welcome more of it; and should, if it were true, advise our electrical friends to try its effect in enlivening their own

business in lighting, and—shall we say?—heating and cooking. Hopefully, the electrical industry are looking to Olympia; but the lessons of Earl's Court are being carried throughout the country, and will continue to be so carried in the future. Olympia will only act as a spur, and will certainly not produce dejection.

Law-Created Sunday Rest.

In the consideration by gas-works administrators of the well-being of the workers engaged in the production of gas, the important matter of Sunday rest receives occasional thought, which is not backed in all quarters by an irresistible amount of enthusiasm. The question of the capital outlay necessary to enable the complete closing down of manufacture for even a single shift on a Sunday is one the momentousness of which has been magnified by the increasing Sunday day-load on top of the heavy Saturday night consumption; and those who in former days raised this objection, put it forward to-day as being more forbidding still. We boast our superiority over the electrical industry in being able to meet the varying requirements of a community and emergencies through the power of storage; but storage, though competent, has not produced a cessation of labour for at any rate part of a Sunday in all gas-works. Progress, however, has been made; and we say now, as we have said before, that in most cases where the old practice continues, "Where "there is a will, there is a way." Some of our largest gas undertakings have proved, and continue to prove, the practicability of a Sunday stoppage; and the provision of the necessary means for permitting a cessation of labour for a period on that day is, therefore, for the majority of other undertakings, only one of degree. In Belgium, the Government have, by an enactment of July 17 this year, got over the difficulty of unsubmissiveness to the Divine command as to labour by, in most occupations, causing it, from and after the corresponding date of next year, to be unlawful for employers to engage their workpeople more than six days a week; the day of rest to be Sunday. In other classes of labour, included in which are gas undertakings, it is to be unlawful to employ persons for more than six-and-a-half days a week or thirteen in a fortnight. Members of an employer's family and his domestic servants are not to be subject to this particular law; but in all industrial and commercial establishments, Sunday is to be observed as a day of rest—exceptions being in the case of (1) work rendered urgent by unavoidable circumstances or necessity, (2) caretaking of business premises, (3) necessary cleaning, repairs, or preparatory work, and (4) work necessary to prevent the deterioration of materials or products. Among the businesses and enterprises in which persons may only be engaged thirteen days out of a fortnight, or six-and-a-half days a week, are included lighting, the distribution of water and power, land transport, loading and discharging at ports, wharves, and stations, and industries in which, by reason of their nature, the work must be continuous. Every gas-works has its exigent times, when work cannot be interrupted; but evidence has accumulated which assures us that, save at such times, the Belgian law would not act harshly even in this country. The passing of the law shows that in Belgium employers have failed in their moral duty, and civil law has stepped in. For our own part, we would prefer to see moral duty superior to civil law.

The Operation of the Workmen's Compensation Acts.

In another part of to-day's issue will be found some figures abstracted from the Home Office report relating to proceedings under the Workmen's Compensation Acts and the Employers' Liability Act during 1904. The usefulness of this return is, of course, marred by the fact that it only deals with a comparatively small proportion of the claims—the great majority being settled by agreement without any details transpiring. Even in cases of death, only about 25 per cent. came in any way before the Courts last year (this percentage being higher than in any of the preceding five years); and some of these were finally settled amicably, while in other instances the only question was the apportionment of the compensation among the dependants. In cases of injury, there are no means of accurately ascertaining the percentage taken into Court; but it is stated that unofficial figures available for certain industries lead to the conclusion that the cases in which litigation results represent less than 1 per cent. of the total number in which compensation is payable. So far as the figures in the present report go, they do not show any very great change over those which were noticed in the "Journal" twelve months ago. There was an increase in cases taken into Court; but the appeals continue to satisfactorily diminish in number. Of the seven industries which come under the Compensation Acts, there is at any rate one in which it is possible to state the extent of the burden thrown upon employers. Returns furnished by the Railway Companies showing the amount paid as compensation (including disbursements to Insurance Companies and to funds under certified schemes) give a total for last year of £162,155; and it is computed that, taking the number of persons employed and the average weekly earnings, the amount paid as compensation in 1904 works out at less than 10s. per £100 of wages. Though the statistics relating to railways are hardly likely to be applicable to other industries, this figure is of value as indicating approximately the extent of the liability that may (in given circumstances) be incurred under the Acts.

Some Municipal Trading Considerations.

The study of a pamphlet by Mr. J. Holt Schooling, on "Local Rates and Taxes," has caused the "Engineering Magazine" to make some exceedingly unkind remarks with regard to the trading tendencies of municipalities. Mr. Schooling has devoted some considerable amount of attention to the subject with which he now deals; and his well-known capacity as a statistician enables him to so marshal his figures as to exhibit their full significance. The series of articles from his pen bearing the same title which nearly a year ago appeared in one of the popular magazines, was noticed in the "Journal" at the time; and certainly the condition of affairs revealed was of a sufficiently startling nature to give rise to some uneasiness. Of late there seems to have been a lull in the criticisms of municipal trading—perhaps because all, or almost all, that can be said on the subject has already been said; but there is urgent need to keep the facts in the public mind, and therefore it is to be hoped that Mr. Schooling's pamphlet will enjoy a large circulation. One result of it has been the outspoken article in the "Engineering Magazine" to which we have referred. After quoting Mr. Schooling's statement that the average yearly profit per £100 of capital invested in municipal reproductive undertakings comes out at 6s. 3d., our contemporary asks whether it is worth while dislocating the trade of the country, stifling the principle of free competition, and introducing the possibility of every kind of corruption and back-stairs influence, in order that a few hundred councillors may enjoy the patronage and direction of affairs for so poor a result. By those who regard the question from a profit-making point of view, there can be only one answer given—especially when it is borne in mind that adequate provision for depreciation would much more than wipe out this poor little gain. But the financial benefit derivable therefrom is not, of course, the only argument advanced by the champions of municipal trading. Neither, however, is a possible monetary loss the only point urged by the opponents to this policy of public ownership. Besides the several considerations just enumerated, there are many others which are set forth by the "Engineering Magazine" in its denunciation of municipal trading. It is, of course, the case that many men of no particular qualifications, by being made councillors, are put at the head of spending departments, and so entrusted with the care of interests which would not be placed in their charge in their private capacity; and it is also no doubt the fact that the general tendency of municipal bodies is towards monopoly. This has, says our contemporary, led the municipal trader in the past to endeavour to stifle competition; and as an instance of this, it is stated that "it is not an uncommon thing for the gas authorities of large towns to try to squeeze out the retail gas-fitter by confronting him with such an amazing mass of rules and regulations that it is difficult for him to comply with them." This seems rather an extreme view to take; for there are obviously other reasons than that named which have made desirable some action towards controlling the private gas-fitter. Another example quoted is "the strong and bitter struggles made by municipal authorities against the desire of private firms to supply electricity for power purposes within the municipal area at lower rates than the municipality can make for itself." In this case, again, it is difficult to see that the local authorities have acted differently from what

companies would have done under similar circumstances. There are, however, many other points raised by the "Engineering Magazine" which we have not space to refer to here, but which will well repay perusal by those taking an interest in present-day municipal politics.

Free Labour Association.

The work of this Association, during the thirteenth year of its existence, continued to be as helpful to employers and to the cause of labour as in the preceding twelve. The scope of its usefulness and activity is, of course, limited by opportunity; and it is only through the lessening of the degree of opportunity, that the Association have not any very greatly exciting tale to tell in the report (an advance copy of which we have received) for the year ending October, 1905. They have, however, through the assistance they are in a position to render employers, accomplished a large part in bringing about the settlement of strikes in various directions, though not immediately affecting the gas industry; and, in connection with the Bill to legalize the so-called peaceful conduct of trade disputes, they have been active in exposing the character of the "peaceful conduct" of Trades Unions in such matters. The organization is a veritable thorn in the sides of the latter; and they would do anything to wreck it, so that they could carry on their coercive tactics without the restraint it offers them. It is inevitable that the Association should be the subject of the most malignant misrepresentation. Their very position lays them open to this kind of thing; and this should be remembered by all who have hitherto rendered them financial aid. Certain statements by the General Secretary (Mr. W. Collison) show that there are those among old supporters who have withheld subscriptions; and it is believed entirely through misrepresentation. If this is so, then, in common fairness, investigation should precede the further withholding of support. There may be another explanation, in the comparative freedom of late from industrial dispute. But it is in times of peace that such an organization should be fortified in every possible way; for any decline in its power gives a corresponding addition of power to the aggressive and coercive Unions. There would be great cause for regret if an Association that has such a record of good at its back should either suffer or be weakened through the misrepresentations of its strong opponents. In the thirteen years, the Association, it is seen by the report, have obtained the support and co-operation of 3000 employers of labour and 500,000 workmen; branches and agencies have been established all over the country; and 500 strikes have been defeated. During the twelve months ending August, no less than 19,216 workmen, embracing many trades and industries, have been registered by the Association. An organization which aims at giving freedom to labour and protection to non-unionists, and brings such effectual power to bear upon industrial disputes, deserves well at the hands of employers and workmen alike in all branches of industry.

An Early Gas Agreement.

An interesting reminder of the great difference there is between the terms on which consumers are now supplied with gas and those that prevailed in the early days of the industry, is afforded by an old document which an esteemed correspondent has just sent on for inspection. Conditions of life generally, as well as those of the gas business in particular, must have sensibly altered since the date of this agreement—1820. Even if that excellent (but much maligned) instrument the gas-meter had never come into use, it is quite certain that present consumers would not be content with an arrangement binding them to burn their gas up to nine o'clock only, on week-days. Something like a century ago, however, persons were glad enough to pay a goodly price even for this limited privilege; for, according to the account before us, the charge of the Loughborough Gas and Coke Works, on the conditions named, was 50s. per annum for a No. 4 burner —7s. each for the two quarters from Lady-day to Michaelmas, and 18s. each for the two winter ones. This figure, it is intimated, was estimated upon a flame of 2 inches in length, with which regulation the consumers were requested to comply. For their own sakes, the lucky possessors of these burners must have been anxious to fall in with the wishes of the gas suppliers in this respect, for they were informed that "if the flame be longer, the light will be less clear and intense, a waste of gas takes place which passing off with an imperfect combustion produces smell, dirt, and smoke, so as to disfigure the ceiling." In those days a birthday party was apt to become an expensive affair in the matter of lighting, if the gas inspector happened to be abroad—that is, of course, supposing the owner of the burners had not sufficient presence of mind to turn them off when nine o'clock arrived—for the document bears the following solemn warning: "Every person found burning the gas beyond the hours agreed for, or on Sundays, will be deemed to have so acted for the quarter, and will be charged accordingly." It is greatly to be feared, however, that the sort of person who now delights in watering his back garden surreptitiously with a hose existed even in those days, and that in consequence the suppliers of gas were frequently made to suffer. The introduction of the gas-meter, of course, put an end to that source of loss. But even this instrument can be circumvented at times, for are we not all familiar with what the general newspaper Press persists in calling the "ingenious device" of bye-passing the gas by means of an india-rubber tube? Other recommendations contained in the document before us are that the gas should be burnt with a glass chimney, and that when the lights were to be put out the stop-cock to each one should first be turned, and after that the main-cock should be shut. Altogether this contract note, made out eighty-five years ago, seems to be but one more proof that the "good old days" were not half so good as is popularly supposed to have been the case—possibly because distance has lent enchantment to the view.

Mr. William King.

We are glad to learn that, after a most enjoyable journey, entailing an absence from home of eleven months, Mr. and Mrs. William King are now back at Beach Lawn, Waterloo, Liverpool, having arrived on Saturday week. The following outline of the pleasant and interesting tour which Mr. and Mrs. King have had round the world is taken from a letter written a few days ago. They left England on Oct. 21 of last year in the *Omrah*, of the Orient Pacific Line, and arrived at Sydney, *viâ* the Suez Canal, on Dec. 4, proceeding from there to Wellington. New Zealand was left on March 11, after an extended journey through the North and South Islands. They then returned to Sydney, going thence to Eastern Australia and the Island of Timor, and so to Manila and Hong Kong. From there they went to Macao and Canton, going back to Hong Kong. Afterwards they visited Shanghai and Nagasaki and the Inland Sea of Japan, landed at Kobe, and made a lengthened tour through Japan. Mr. and Mrs. King were in Tokio when the news was received of Togo's great victory over the Russian fleet. The visit to Japan ended at Yokohama; and they left there on June 11 for Honolulu and San Francisco. They next went to the celebrated Yosemite Valley and Mariposa Grove of "Big Trees," and then to Del Monté and Monterey on the Southern Pacific coast. Starting again from San Francisco, they went, *viâ* the Shasta route, to Portland, Oregon, and thence to the rapidly increasing towns of Seattle and Tacoma. Leaving the United States, they entered British Columbia at Victoria, and so to Vancouver, where they got on to the Canadian Pacific Railway, and went by that line through the splendid scenery of the Selkirk and Rocky Mountains. From Banff, at the eastern end of the "Rockies," they made a long run to Ottawa, and afterwards to Montreal, where they got on board the *Victorian* for Liverpool. Unfortunately this steamer went on the rocks in the St. Lawrence, and Mr. and Mrs. King were landed at Quebec, and left that city in the *Bavarian* on Sept. 9, and arrived safely at home on the 16th inst.

We have received from George Newnes, Limited, Part X. of the "Technological and Scientific Dictionary" now in course of publication by them, under the editorship of Mr. G. F. Goodchild, B.A., and Mr. C. F. Tweney. It extends from "Pyrimidines" to "Santonine," and consequently includes "Radiation," which is fairly fully dealt with, as is also "Radioactivity"—the latter subject being illustrated by diagrams. A concise account is given of radium. "Roofs" is a subject made clearer by illustrations.

During the next twelve months there will be made, in the United States Geological Survey's laboratories at St. Louis, comprehensive tests on certain structural materials. They will include: (*a*) The examination of the constituent materials of mortar and concrete; (*b*) tests of mortar; (*c*) tests of concrete; and (*d*) tests of reinforced concrete beams. The determination of the usual tensile, compressive, and transverse strengths of concrete composed of various mixtures will be included under the third heading, as well as the weights, porosity, resistance to heat and cold, and the metal-protecting properties of the specimen. Under this heading will be included tests of the strength of concrete beams and building blocks. In the last group will be tests to determine the effect of varying the percentage of metal reinforcement in concrete.

THE ELECTRICAL EXHIBITION.

UNDER atmospherical conditions calculated to damp the spirits of the most enthusiastic of electricians, the Electrical Exhibition at Olympia was opened by the Lord Mayor (Sir John Pound) yesterday. Let us first say that we compliment the Committee who have had the organizing of the exhibition in hand on their choice of a building. True, it is a little farther from the centres of London than Earl's Court. But the large hall is spacious and lofty, and comfortably gives, with the galleries, place for the 165 or so exhibitors. Let us also congratulate the Committee on having done the Organizers of the Gas Exhibition the honour of having taken so many hints from their methods of procedure—even to obtaining the kind offices of the ever-genial Lord Mayor and his Sheriffs to open the exhibition. In the similarity of arrangements and methods, we trace the work of the energetic Messrs. Bridges and Smith, the Organizing Managers.

It is a unique experience for a Lord Mayor of London at almost the start of his official year to be called upon to open a Gas Exhibition and to bless it, and then to be asked to do the same thing for the greatest business rival towards the close of his official year. His Lordship played his dignified part yesterday as though there had never been any such affair as the Gas Exhibition. The proceedings at the opening followed on the lines of those at the inauguration of the Gas Exhibition, with the exception that the corps of the Electrical Engineers Royal Engineers Volunteers provided a guard of honour in place of the long ranks of gas-workers who had fought for their country in distant parts of the world. In the absence abroad of the President of the exhibition (Sir William Preece), the Lord Mayor and Sheriffs were welcomed at the main entrance by the Chairman (Mr. E. Cunliffe-Owen) and members of the Executive Committee; but beyond those who had been invited to the lunch which followed the opening ceremony, there was a very small sprinkling indeed of spectators. The Lord Mayor and his colleagues paid, in their long perambulation, most conscientious regard to the stalls, probably the while wondering what they should say if anyone asked them what the Corporation meant by those new gas-lamp columns that are at this very time being put up in Queen Victoria Street, Fleet Street, and elsewhere within City bounds. It was a weary wait while Sir John and his following made the tour of the exhibition; but eventually he reached the little stand erected in the centre of the hall, where he declared the exhibition open. He remarked upon the pleasure it gave him to open the exhibition, and upon the fact that it was compatible with the dignity of his office to do all he could to further any industry having for its object the well-being of the people—adding that he did not think anyone could deny that this claim could be made on behalf of electricity. After this, the lunch; and the large hall then wore an almost deserted appearance.

Workmen were busy right up to the time of the arrival of the Lord Mayor; and it was evident—this is the usual experience—that there had been a great scramble to get things into fairly presentable shape for the opening. The exhibition has not drawn the makers of heavy electrical machinery; and the whole of the ground floor is covered by goods of lighter kind, with a good deal of padding in the way of electric bell fittings, telephones, and so on. Messrs. Crossley Bros. are there with gas-engines; while suction gas-plants and conveyors are also to be seen among the plant. There will, it is evident, be a pretty bill to pay for current even at 2d. per unit, as the stands are being lighted with arc and incandescent lamps placed so closely together that it is a question whether one effect will not be to do serious wrong to the visual organs of visitors. In the nervous anxiety to make an impressive show of light—regardless of expense—some of the stands are overdoing this part of their display. The exhibition is going to teach us something, too, about those vague subjects—electrical cooking and heating; but we have been wondering whether the lunch the Lord Mayor, the Sheriffs, and the electricians enjoyed yesterday was electrically or gas cooked. For fittings and lamps, the galleries must be inspected. During the exhibition, there are to be lectures by eminent electrical engineers; but whether these will attract the public is rather questionable. An electrician was heard to remark yesterday before the opening, "I think this is going to do us a rare lot of good." He was very evidently one of the representatives of a manufacturing firm. Electrical manufacturing firms can do with a little encouragement; for, taking them all round, profits have not been on a magnificent scale for some time now.

It may be remembered that at the St. Louis Exhibition last year, an investigation of the coals and lignites of the United States was carried out under the supervision of the Director of the United States Geological Survey; the sum of £6000 having been voted by Congress for the purpose. Testing machinery was generously contributed by various manufacturers, and much valuable work was done with the plant; so elaborate a series of coal analyses having never before been made in the United States. The experiments showed that most of the American bituminous coals and lignites can be used as a source of power in a gas-producing plant; the power efficiency of such coals when thus used being $2\frac{1}{2}$ times greater than their efficiency when burnt in a steam-boiler plant.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 831.)

THE Stock Exchange continues under the influence of gold exports, and the prospects of dearer money, which has, to a very large extent, paralyzed business. When it was found that there was no change in the Bank-rate last Thursday, a general recovery set in; but the improvement was not maintained, as it is recognized that a rise in the value of money is only postponed. The fact that discount rates are kept well up to the Bank-rate indicates the uncertainty of the monetary outlook, which can so easily influence the stock markets. It must not be forgotten that a good deal of professional buying took place, both before and after Peace was concluded, which caused values to advance in nearly all departments; but the public did not support the rise to the extent anticipated. Speculators for the rise have consequently been covering their commitments; and with the absence of support, values have declined. But with a small bear position very little selling is quickly felt. Consols and other gilt-edged stocks have drooped slightly; the former being affected by the monetary considerations. Gas stocks, though less active, have stood their ground well; the only declines recorded being $\frac{1}{2}$ in Gaslight ordinary to 99-100, and $\frac{1}{4}$ in Primitiva prefs. to $5\frac{1}{4}$-$5\frac{1}{2}$, while against this there have been seven advances. Business was done in Gaslight ordinary—chiefly between $99\frac{1}{4}$ and $99\frac{3}{4}$, though on Saturday transactions were recorded at 99. Dealings also took place in the $3\frac{1}{2}$ per cent. maximum at $91\frac{3}{4}$ and $92\frac{1}{2}$; while some small amounts changed hands in the 3 per cent. debentures at 89, though business was also done at $89\frac{1}{2}$, and in the 4 per cent. prefs. at $111\frac{1}{4}$. South Metropolitan came in for some attention at 133, $133\frac{3}{4}$, and 134; while dealings were recorded in the debentures at $89\frac{1}{2}$ and $89\frac{3}{4}$. Commercials were very quiet; but business was done in the ordinary at 118 and 120, and in the $3\frac{1}{2}$ per cent. at $115\frac{1}{2}$. Among Suburban stocks, West Ham ordinary has advanced 1, to 104-106, business being done at 105; while South Suburban is also 1 higher at 123-126, dealings being recorded at $123\frac{1}{2}$ and 124. The debenture stock is 2 up, at 132-137. In the Provincial stocks, business was recorded in Southampton at 112; and small amounts changed hands in Bournemouth "B" at 17, free of stamp and fee. The Continental group again showed firmness; Continental Union being now quoted at 118-121, while business was recorded at $118\frac{3}{4}$, $119\frac{1}{4}$, and 121. Imperial Continental also advanced 1, to 218-221, stock changing hands at 219, $219\frac{1}{2}$, and $220\frac{1}{4}$; while business was done in the debentures at 97. Some dealings were recorded in British at $43\frac{3}{4}$, European (£7 10s. paid) at $15\frac{1}{8}$, and Ottoman at $6\frac{7}{16}$. With respect to the stocks in the remoter world, Hong Kong and China are $\frac{1}{2}$ up at 19-20; while business was done in Bombay at $6\frac{3}{4}$ and $6\frac{7}{8}$, Cape ordinary at $17\frac{5}{16}$ and $17\frac{7}{16}$, and Metropolitan of Melbourne debentures at 96 and $96\frac{3}{4}$. Buenos Ayres (new) were in request, and rose $\frac{1}{4}$, to $12\frac{3}{4}$ to $13\frac{1}{4}$, business being done at 13; and in the debenture at $96\frac{1}{2}$ and $97\frac{1}{4}$. River Plate ordinary changed hands at $13\frac{1}{2}$, Monte Video at $12\frac{1}{4}$, Primitiva ordinary at $6\frac{5}{8}$, ditto prefs. at $5\frac{3}{8}$, and debentures at $98\frac{1}{4}$ and 96.

ELECTRIC LIGHTING MEMORANDA.

Payment of Expenses Incurred in attending Technical Meetings—The Propriety Admitted, but hardly Supported by a Report from Swansea—Electric Incandescent Lamps and their Dangers—The Insurance of Electrical Machinery.

THE question as to whether the Chairman and Engineer of an Electricity Department should be allowed, out of the funds of the undertaking, the expenses incurred in attending the annual meeting of the Municipal Electrical Association has been raised at St. Annes-on-Sea. The District Auditor has disallowed the expenses; while the Council think it is highly desirable that these gentlemen should go, without cost to themselves, to the annual conferences. Consequently, the Executive of the Association has been requested to make strong representations to the Local Government Board regarding the importance of Local Authorities being permitted to send delegates to the meetings. So long as Chairmen and Engineers—gas, electrical, or otherwise—connected with municipal or company supply attend such annual conferences animated by the single desire to absorb as much as possible of the beneficial part of the proceedings, then a reasonable expenditure on their part should certainly be defrayed by their undertaking. The topics usually discussed are of current importance; and whatever technical or commercial information is imbibed is such that, if at all useful, it must needs have an almost, if not quite, immediate application to the affairs of their own concern. On all grounds, we are much in favour of every facility being granted for the attendance by professional men at technical and special gatherings of the kind, so long as to the main purpose of the meeting there is an honest adherence. In such cases, the money is thoroughly well spent; and we should be sorry if, because of the few who make such conferences merely an excuse for a holiday, any question such as that raised at St. Annes-on-Sea should deprive others of the advantage of conference, and the conference of their presence. District Auditors seem to have no settled course of procedure in

these matters, for there are, we believe, several places where both gas and electrical engineers have a grant from their Committees for attending the annual meetings of their chief organizations. An attempt is being made to obtain similar assistance for juniors attending, from a distance, the "Gas Manufacture" classes in Birmingham. We take it that the Town Clerks (who are mostly the best paid in officialdom) attending the meetings of the Municipal Association do not stand in personal loss as a consequence. Plenty of precedent will be found for these payments; and we hope that the Local Government Board, as a result of the representations to be made to them, will be able to give some general instructions respecting fair allowances of the kind, so that there may not be these repeated trumpery annoyances, and the prevalent difference of practice in the matter by the District Auditors. There are many other ways in which the Local Government Board can devote themselves to the defence of the interests of the ratepayers, even in connection with an electricity undertaking. It is very doubtful whether the stoppage of allowances in attending technical meetings is in the interests either of the ratepayers or of the undertaking concerned.

Among those in attendance at the last meeting of the Municipal Electrical Association (some of the papers presented at which were noticed in the "JOURNAL" in July last) were Mr. Alexander Sinclair and Mr. Prüsmann, the Chairman and Engineer respectively of the Swansea Electric Lighting Committee. We have not heard of any question having been raised as to the payment of the expenses of these two gentlemen; and as they attended the meeting "in accordance with instructions," we suppose the cost of doing so is going to be discharged by the department. Mr. Sinclair made a report to his colleagues on the impressions he gained at the meeting; but we are not altogether sure, if we were asked to pronounce an opinion as to whether—placing the report (assuming that it represents the essence of the good derived) alongside the account of the expenditure of the Committee's delegates—the department was receiving its money's worth, that we could conscientiously say they were. Probably they are, as (if the Chairman and the Engineer had no settled convictions, although they ought to have had, on the matters before) the meeting has decided them that the day of electric incandescent and Nernst lamps for side-street lighting has not yet arrived, and that the systems of electric prepayment supply and free wiring cannot yet be proclaimed a complete success. Prodigious! Let us be generous, and assume that so far there is value for money; but there is a set-off, to which we will refer presently. It may be remembered that Mr. Hoadley's paper before the Association, and the discussion, on the use of the Nernst lamp in street lighting at Maidstone, supplied matter for interesting comment in the "JOURNAL" in July. We are glad the Swansea report confirms what we had to say as to the distinct weight of opinion there was against the Nernst lamp being a success for street purposes, especially where low-priced gas is procurable. Looking at its contradictory character, we cannot think that there was sufficient cogitation over the drafting of the following sentence of the report: "With regard to free wiring and use of prepayment meters, experience is not yet sufficient to claim complete success; but so far as it has been tried, it promises well, but there are great difficulties in the way." The statement appeals to us as having a good deal about it that is Irish. There is no doubt, however, as to Mr. Sinclair's inmost views on the point. He recommends that, when a favourable opportunity arises, there should be an experiment. A "favourable opportunity" will only be when a number of small houses are being erected, preferably by the same landlord, at the same time; because "isolated or only a few houses do not give promise of success." Gas undertakings, it may be incidentally remarked, supply all-comers.

Now as to the set-off, and the direction in which Swansea will suffer through allowing their Electricity Chairman and Engineer to leave home to attend this year's conference, if their advice is accepted. They have come back from the meeting with some false notions as to the use of electric arc lamps in the streets, and are reporting to the Committee that where arc lighting has been tried on a comparatively large scale success is claimed. They suggest that by extending the arc lighting: (1) The light given will be superior to the existing lighting in the streets. (2) The cost to the ratepayers will be little, if anything, in excess of that already paid. (3) The business will be done at a profit to the electricity works. Ah! this is the secret of the two preceding statements that are diametrically opposed to the common experience. As there has been an opportunity within the last few months of pointing out, the Swansea Electricity Department have not shown up well in regard to their financial methods; and the Local Government Board have given them certain peremptory instructions as to how accounts should be kept. Meantime, the ratepayers are scanning the horizon very keenly for the profits that were promised them long, long ago. But the ratepayers will look curiously at the position when the singular proposition is made that they must pay for more electric lighting in the streets, in order that the Electricity Department may have the pleasure of handing something back to them for their relief. When this common practice is made plain to ratepayers, there will be greater rebellion than at present. The report also suggests that the prices for power purposes must be attractive to secure a large business; but the Chairman does not appear disposed to admit that their own prices are not on a satisfactory basis.

Some time since, by sundry rude shocks, all thought of the incapability of the incandescent electric lamp to do any wrong was swept from our minds. It was once said that incandescent electric lamps could not even raise the temperature of the surrounding atmosphere, much less cause a fire. The deception was early and completely demonstrated; and now we are told that there is danger in the use of these reputed harmless lamps in coal mines. Mr. H. Hall, one of His Majesty's Inspectors of Mines, has been making some tests on the immersion of an incandescent lamp in fine coal dust; and to the "Electrical Review" we have to acknowledge our indebtedness for this information: In one instance, after the lamp had been buried an hour and a half, the temperature rose to 700° Fahr.; and smoke was produced. In another hour the dust was red-hot and caked where the lamp had been lying, and gas and smoke issued for half-an-hour afterwards. An incandescent lamp under ordinary atmospheric conditions will not become very hot, because it is able to radiate freely, and can part with all the heat it generates without rising to a dangerous degree of temperature above its surroundings. But coal-dust is an insulating material—a heat-insulator our contemporary explains—and since the lamp can no longer throw off heat freely, such heat must accumulate until the temperature attains to a dangerous elevation. A curious fact noticed was that, in one case where the lamp failed and the current ceased to pass, the temperature rose more than 200° in the half hour following the explosion, which seems to show that, once heated, the dust continued to oxidize. It is obvious that dangerous fires may be caused by incandescent lamps, even if laid on a heap of dust.

We are reminded of the question of the depreciation of electrical plant by the perusal of the annual report of Mr. Michael Longridge, the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company. In establishing a department for the insurance of electrical machinery, it is patent that the Company have done a service, for while the augmentation of business is said to have been "again satisfactory," the claims upon the Company have increased more rapidly than the insurances effected. The number of dynamos and motors insured at the end of 1904 exceeded the number insured at the end of the preceding year by 20 per cent. On the other hand, the number of breakdowns of insured machines in 1904 exceeded the number the previous year by 28 per cent. The cause of the increase in breakdowns, it is stated, is not apparent, unless it be deterioration resulting from greater age. The rate of breakdown among dynamos is put at 1 in 12, among motors 1 in 9·3, excluding breakdowns of starting resistance switches, or 1 in 8·2 including them. If this is the rate of breakdown among machines periodically inspected by the Company, what must it be among machines that are not so inspected? It may be supposed that it is heavier still.

The New Inverted Incandescent Gas-Lamp Company, Limited, have granted to the Welsbach Incandescent Gaslight Company, Limited, a licence for the sale of their inverted Kern pendant burner.

Property of the total value of £233,349, including net personalty £157,979, has been left by Mr. William Bruce-Dick, founder of the engineering firm of Messrs. Dick, Kerr, and Co., and Chairman of Messrs. W. B. Dick and Co., Limited, oil importers, whose death was lately announced.

A highly interesting visit was paid by the members of the Society of Engineers last Wednesday to the sewerage and sewage-disposal works of the Hampton Urban District Council. It is about seven years since the main drainage works, which were carried out departmentally under the direction of Mr. John Kemp, the late Engineer and Surveyor to the Council, were completed; the cost of the whole scheme being £61,915. Since 1898, extension works have been constructed. The average daily volume of sewage now treated is upwards of 240,000 gallons.

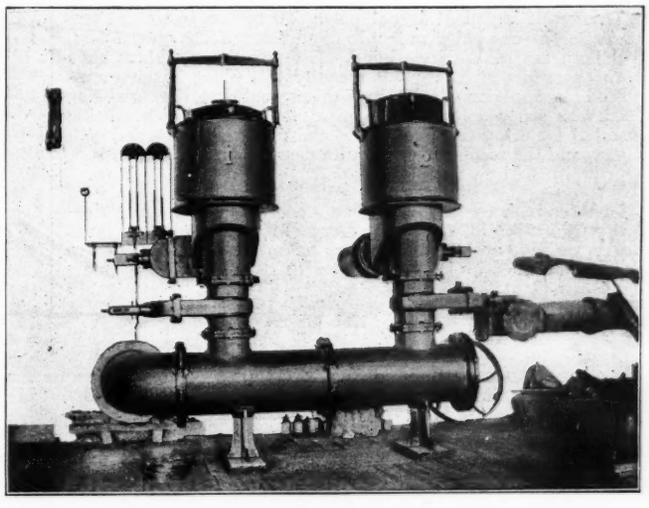
The issue of "The Stocktonian"—the journal of the Stockton-on-Tees Grammar School—for the summer term of the present year, contains an expression of the heartiest thanks of the school to Mr. Matt Dunn for his kindness in conducting a party of the boys round the gas-works on the 16th of June, and explaining to them all the processes connected with the manufacture of coal-gas, on which he had previously given a lecture at the school. With the view of stimulating accuracy of observation in the boys, Mr. Dunn offered prizes for the best essay on the visit. It is gratifying to find that the papers, on the whole, were very good; "reflecting," Mr. Dunn says in his letter announcing the awards, "great credit on the authors." Five are specially mentioned as bearing evidence of the interest of the writers "in the mechanical appliances, as also in the routine, adopted for the production and treatment of coal gas." The prize winner was Norman Graham, whose paper is printed in the journal. Mr. Dunn characterizes it as "a fine production," the writer's description being "very clearly defined throughout." He was the only student who apparently "minutely noted the course and order of treatment of the evolved gases; giving most correct technical terms and titles, besides dealing with the extracted bye-products in correct order." We have read through Graham's essay, and can fully support Mr. Dunn in his appreciation of it. It testifies to the possession by this youth of powers of observation which he will find valuable in whatever sphere he may move. In acknowledging the indebtedness of the school to Mr. Dunn, recognition of the hospitality of Mr. W. Ford, the Engineer and Manager, in providing refreshments, is not forgotten.

AN INTERESTING SCHEME OF WORKS RECONSTRUCTION AT NORWICH.

[Second Article.]

Another Problem and Its Solution.

Having completed the survey of the coke plant, and passing into the carburetted water-gas house, we are brought face to face with a set of governors on the carburetting-floor, and are reminded of a paper Mr. Glover read to the Eastern Counties Gas Managers' Association in April of last year, as published in the "Journal" at the time.* An explanation is required here. At the two works as formerly existing, the Company had valuable plant which they did not wish to sacrifice; and, as has been seen, the scheme was to make the two works, though separate, into one complete works. To do this, purifiers, meters, district governors, and so on had to be all located at the Bishop Bridge site, to relieve the St. Martin-at-Palace site. It then became a question whether the main between the two works should be under pressure or under exhaust. The Company had, at the time, exhausters at the Palace works end; but Mr. Glover did not quite like the idea of having a foul main under pressure in the streets, with supplementary exhausters at the other end to relieve the main. After consideration, he found that he would be able to do away with the exhausters at the Palace end, and do the whole of the exhausting from the Bishop Bridge works—the distance, as already stated, being about ½ mile. The further problem was how to maintain a uniform exhaust on the retorts at the Palace works and work with light seals, with the exhausters so far away. Fortunately, Mr. Glover had noticed the use of retort-house governors by the South Metropolitan Gas Company some years before; and the observation then made came in most usefully now that he was confronted by this problem. An installation of Messrs. Parkinson and Cowan's (Cowan Branch) governors was put in; and it is seen that, although there is considerable variation on the outlet of the governors, the inlet pressure is kept constant. The outlet of the governors is the inlet to the condensers; and the exhausters (½ mile or more away) exhaust on the outlet to the scrubbers at the Palace works. This is unusual; but it suits the peculiarity of the Norwich works.



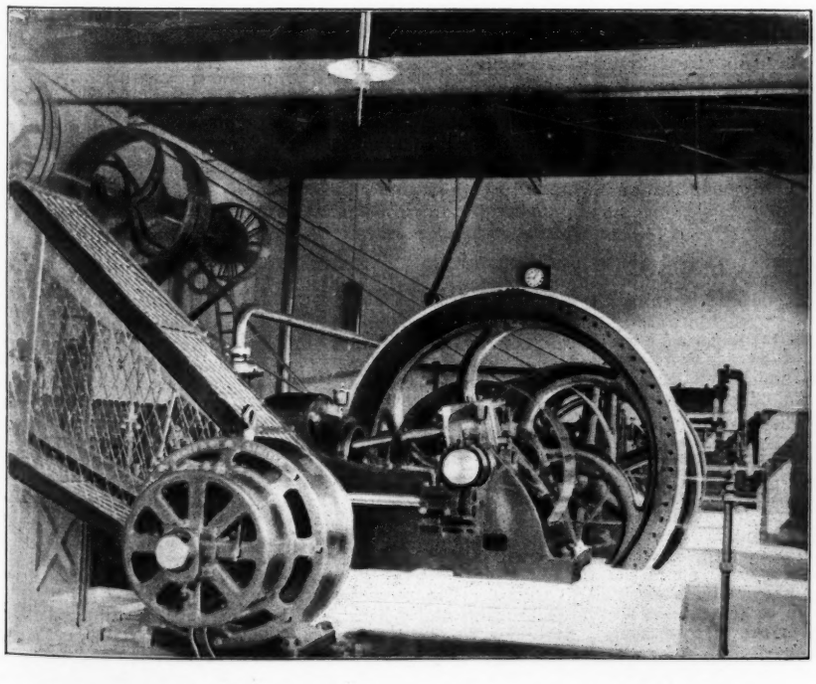
Retort-House Governors at the St. Martin-at-Palace Works.

Carburetted Water-Gas Plant.

It has been mentioned that the carburetted water-gas house is not a new building, nor is the plant. But there are features of interest to be noted. The plant, which consists of two units of 500,000 cubic feet each, is of Messrs. Humphreys and Glasgow's make. It is, mentions Mr. Glover, a valuable plant, because of the restricted market for coke, and the limited space for gas making. Of carburetted water gas, use is made to the extent of 30 to 40 per cent. of the total gas output—the 40 per cent. being the limit. The plant is run all the year round; and there is ample space for extending it when occasion requires. The question of how to dispose of the water from the water-gas plant owing to the nature of the liquid, as well as the question of the separation of the tar from the scrubber water, have proved troublesome to many gas engineers. Now at Norwich it is found that, by recirculating through the scrubbers the water which comes from them while it is hot, the tar separates much better, and that the method gets over the difficulty of having to dispose of the unpleasant liquid into the river or in some other way. The use of hot water in the scrubbers, it is true, throws more work on the condensers; but it is found that a higher duty can be obtained from them by regulating the flow of the water with a small Worthington pump acting direct over the apparatus.

Reverting to the carburetted water-gas plant, the next proposal is, when opportunity serves, to put in larger generators without altering the other part of the plant. The plant was built for the production of 25-candle gas; and the carburettor and superheater are somewhat out of proportion to the lower qnality of gas made nowadays. The parliamentary standard for the distributed gas is 15 candles; and 15¾-candle gas is the average sent out. A fairly large proportion of carburetted water gas is made; and therefore it need not be of very high illuminating power—17½ candles being what is now produced, although, as stated, the plant was designed for 25-candle gas. Therefore by putting in larger generators, a greater capacity will be secured, at a relatively small expenditure. At these works there is a relief gasholder, with a capacity of 275,000 cubic feet; but there is no other storage here.

* See also "District Association Reports" for 1904, p. 196.



Power House for Compressing Air and Generating Electric Current—St. Martin-at-Palace Works.

Condensers—Rapid Chilling and Naphthalene.

Outside the retort-house are a pair of vertical tubular water-cooled condensers of Messrs. R. & J. Dempster's make, arranged with reversible connections both for gas and cooling water. In these, the gas is exposed to a large surface; and it is thus chilled very rapidly. "Now it is rapid chilling of this kind that seems to me to be the *natural* means of removing naphthalene." This, from Mr. Glover, is well worth noting. The inlet and outlet the rmometers on the condenser in use were observed; and it was found that the temperature was 130° at the inlet, and by the time the gas reached the outlet it was from 60° to 70°. Mr. Glover waxed almost eloquent on this subject; and it was

gathered that he does not make a strong point, after his experience with these condensers, as to bringing down the gas to a low temperature. His former faith that this was important, has undergone a change. What he finds is that, by the rapid chilling of the gas, a great deal of naphthalene is left behind at the condensers; and since these new ones were put into use, the naphthalene content of the gas, per 100 cubic feet, has gone down to 3 or 4 grains. Now this gas mixed with 30 per cent. of water gas renders the gas harmless on the district; there is, in fact, no trouble whatever. Therefore the naphthalene plant at Norwich is only an auxiliary now, to be used in the event of something going wrong, or some particular difficulty cropping up which might give a great deal of naphthalene.

Scrubbers.

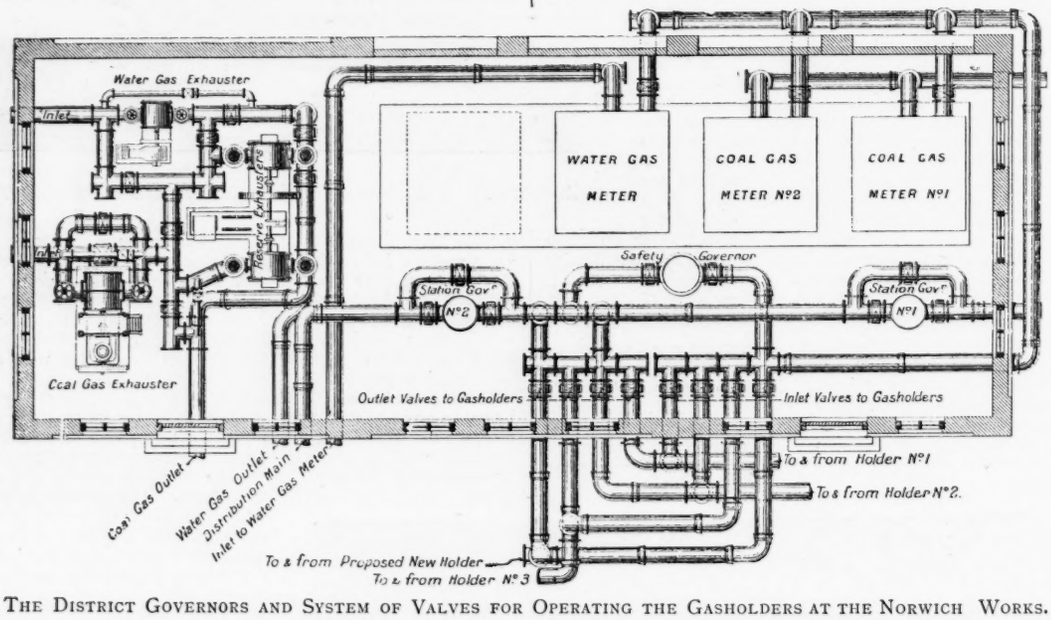
The scrubbing plant is not new. There are two scrubbers 50 feet high—one being 12 feet in diameter, and the other 8 feet, and both are of Walker's build. Hitherto the scrubbers have been charged with coke; but recently this filling has been replaced by boards on edge. Up to the present time, they are being used with water only; but the necessary connections are being inserted for using them in series—the first being supplied with liquor, and the second in series with clean water.

The Power-House.

In order to keep something like a continuity in the manufacturing processes in writing the story of the happenings at these works, we have neglected the power-house, which really ought to have been dealt with in connection with the retort-house, as the handsome plant that has been installed is entirely employed in the operation of the combined charging and drawing machines and the coke plant. The existing boilers and boiler-house had no margin of power to spare for the new plant, and were so situated as to render extension difficult. Even had an extension of the boilers being possible, the distance from the new power house added another objection to their use. So it was decided to use gas-engines for developing the power required; and a 75-horse power "National" gas-engine, and a "Tangye" gas-engine of similar power, were installed. These have given great satisfaction, and have served as a useful object-lesson to consumers, in the successful application of gas to power purposes. The gas-engines are arranged in duplicate, and drive a counter-shafting, from which are driven a West's Gas Improvement Company's air-compressor and a Laurence, Scott, and Co.'s 37-kilowatt dynamo. The electricity generated is used for driving the coke plant, and is carried (by suitable insulated cables) from the dynamo to the main switchboard, and then to the starting switches of the motors referred to in dealing with the coke plant. Messrs. W. J. Jenkins and Co. were responsible for the whole of the electrical work. An ingenious arrangement is used for operating the air-compressor. The belt pulley on the machine is fitted with an expanding friction-clutch, which is thrown out of action automatically when the air-compressor has risen to 65 lbs. per square inch, and, when the pressure falls, the clutch is automatically put into gear again. This enables the gas-engine to run continuously, but only to exert its full power when required.

Miscellaneous Plant and Notes.

There are a few miscellaneous points about the Palace works still to be mentioned. One of the first things that strikes one's attention on entering the works is a beautifully kept grass lawn—the position being one which cannot at present be utilized, and a pleasant view is as inexpensive in the end as an eyesore. This grass lawn claims admiration; but it is just beyond, next to the



The District Governors and System of Valves for Operating the Gasholders at the Norwich Works.

river, that a pair of circular tar and liquor storage tanks above ground are observed by anyone in special search of engineering feature. These tanks appear on the right-hand side of the lower photograph which was reprodnced in last week's "Journal," p. 741. The contiguity of the river caused a great deal of trouble in getting in the foundations practically throughout the works; and a good deal of underpinning had to be resorted to. To the same reason these above-ground tanks are accountable; for the construction of storage tanks below ground would have been very expensive. Only small sump tanks, with the wrought-iron storage tanks above, have been put in; each of the tanks having a capacity of 100,000 gallons. Approximately the tanks cost £750, as compared with an estimate of £2000 for underground tanks; so that the disability in respect of underground tanks meant a saving in expenditure. Messrs. R. & J. Dempster, Limited, were the contractors.

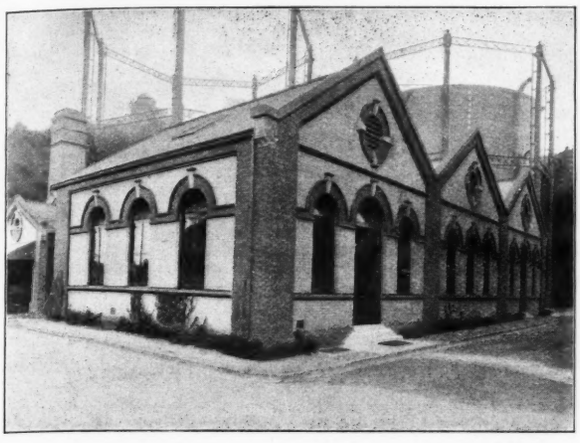
Returning to a small group of buildings under the same roof as, or near to, the carburetted water-gas plant, a house is pointed out in which at one time were lodged the water-gas exhausters and the water-gas station meter. These have now been transferred to Bishop Bridge works. In another house are seen two good, but not new, Lancashire boilers, which can be fired either by coke, breeze, or oil tar as the occasion arises. There is a well-equipped workshop, with lathe, drilling-machine, and shaping-machine; and a fine smithy with a couple of hearths. A few steps away is the pump-house, newly built; the most difficult part of the work being that the whole of the pumps and foundations had to be raised 3 or 4 feet. Five small pumps occupy the house; and, by them, these and the other works are kept well supplied with river water. A mere glance into the men's quarters before leaving the station also furnishes evidence of most cordial consideration on the part of the Company for their men. The mess room is large and fitted in a manner to induce methods of tidiness and cleanliness. In the dressing-room above are clothes racks and lockers; and adjoining are bath, shower bath, and lavatory basins, all fitted with hot and cold water. The men have every reason to be pleased with the provision made for them.

At the Bishop Bridge Works.

We now leave the St. Martin-at-Palace works; and a short walk brings us to the Bishop Bridge works, where is found the continuation of the unique scheme. On this site, in addition to the works offices, all there is to be found are the meter and exhauster house, the noble-looking purifying-house, a new boiler house and chimney (with open front, and containing two boilers fitted with Meldrum furnaces), the gasholders (of a combined capacity of 1,300,000 cubic feet), the well-equipped workshops for district work, and the old retort-house, coal-stores, and purifying-house cleared completely, and designed for other useful occupation now that carbonizing work has ceased at this station. It is the meter and exhauster house and purifying-house that must claim greatest attention in this descriptive account.

Meter and Exhauster House.

The meter and exhauster house is a building 35 ft. wide, by 92 ft. long, by 18 ft. to the wall plates. It is light, large, and airy, and has a neatly decorated interior. Here we find the coal gas and water gas exhausting plant, coal gas and water gas station meters, the gasholder controlling valves, and the district and safety governors. We cannot here do better than reproduce the plan,



STATION-METER AND GOVERNOR HOUSE, WITH BOILER HOUSE—BISHOP BRIDGE WORKS.

showing the location of plant, and the system of connections, from the paper read before the Eastern Counties Gas Association by Mr. Glover last year.

Regarding the exhausting plant, a new vertical engine and exhauster of 150,000 cubic feet per hour has been put in by Messrs. Bryan Donkin and Clench, Limited; and there are also the old twin exhausters with horizontal engine between—each exhauster being of 60,000 cubic feet capacity, and capable of being worked separately—in reserve. The gas passes from the exhausters over to the purifying plant, and back again to the station meters, of which there are three—two for coal gas, and one for water gas. From here, it passes to the set of valves in front of the station meters (see diagram). To Parkinson's branch of Messrs. Parkinson and Cowan were confided the district governors, the meter connections, station meter work, valves, and connections. The station meters were removed from the old site, as well as one of the old governors. In fact, Mr. Glover tried, it is clear, to be as economical as possible, even to bringing into use the old roof principals and bricks where possible.

Respecting the governors, we may quote the following passages from the paper previously referred to:—

> The new governors are of the Parkinson equilibrium type, with a simple but effective water-loading arrangement. The two new governors have displaced three of the old type. One of the old governors has been retained for use as a safety governor, and is so weighted as to come into operation if the pressure from the holders should for any reason be insufficient to keep the ordinary governors supplied. It will be noticed that the gasholder inlet and outlet valves are all in line. They are provided with standards and indicators showing at a glance the holder into which the make is being sent, or from which the city is being supplied. This grouping of the valves has been made possible within the area occupied, by using one line of pipe alternately as inlet and outlet; it being the rule to work into one holder and out from another. The advantage of such an arrangement will be readily understood.

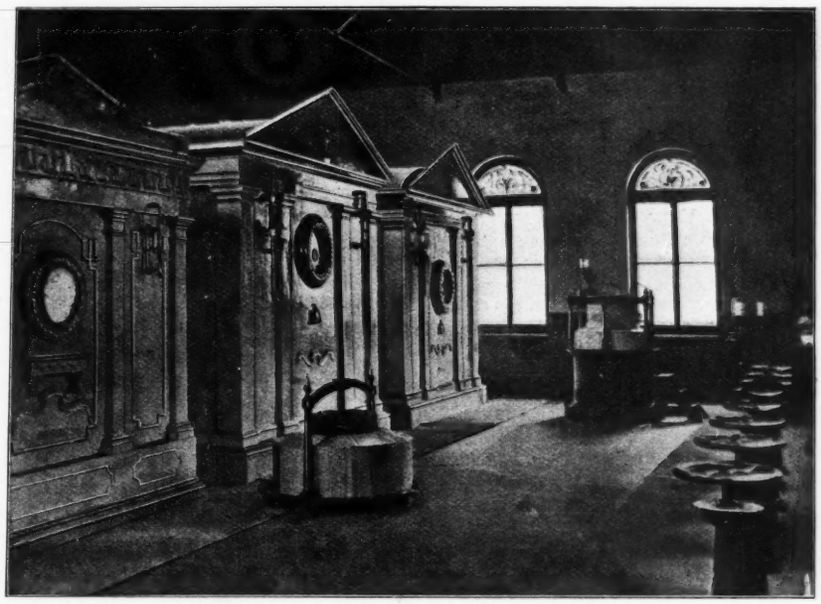
One man in attendance is able to very comfortably look after the whole of this house—the exhausters, the reading of the station meters, the controlling of the valves, together with the boilers in the small house adjoining.

CARBURETTOR.

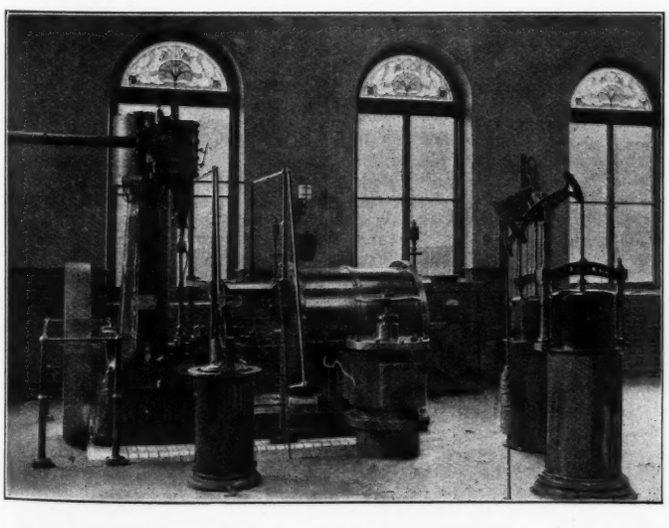
Before passing to the purifying-house, we are introduced to a carburettor fixed over a large valve on the inlet-main to the holders. The valve controls the flow of gas through the carburettor, where suitable solvent oils are volatilized, and the stream of gas carries the oil vapour forward, condensing out whatever naphthalene it contains, and preventing naphthalene forming or depositing in the shape of crystals.

THE PURIFYING-HOUSE.

Here we have the most imposing building on the Bishop Bridge site. It is a three-storey open steel building, with a massive brickwork gable end, built (so far as the brickwork and roofing were concerned) by Messrs. Vale and Sons, as were the other brickwork structures on the works. The Horseley Company, Limited, did the whole of the structural steel work; and Messrs. Newton, Chambers, and Co., Limited, the purifying plant work. The dimensions of the buildings are 115 ft. wide by 125 ft. long, by 40 ft. to the wall plates. Before describing the structural features, it will interest to learn that twelve months ago the Company went over to oxide completely for purification. Previously they had been confined, for fear of sulphur compound difficulty, to lime. The question of nuisance through the frequent changes of the purifiers was the incentive to the alteration. Mr. Glover, in the interests of relief, induced the Chairman and Directors of the Company and the Town Clerk of Norwich to give their permission to a trial of oxide only being made; the permission being necessary in case the limit of 25 grains was exceeded through the use of dry oxide only. Mr. Glover knew that here he had rather a fine point to deal with, and that it depended largely on the percentage of water gas used. "This," he naïvely remarked to the writer, "again shows where water gas comes in." Up to the present time, with one or two exceptions, they have been able to keep below the 25 grains—20·7 grains being the average now; and this does not cause annoyance to anybody. Careful working with oxide, under certain conditions, undoubtedly absorbs sulphur compounds. A point that Mr. Glover has also noticed, but which he has not seen mentioned in print [we fancy it was raised in the evidence before the Departmental Committee of the Board of Trade],



INTERIOR OF THE METER, GOVERNOR, AND VALVE HOUSE—BISHOP BRIDGE WORKS.



INTERIOR OF THE EXHAUSTER HOUSE—BISHOP BRIDGE WORKS.

General View of the Bishop Bridge Works, Showing the Purifier House and Meter House.

is the question of the effect of the condition of the retorts on purification. In the high settings at the other works, the retorts are often under pressure from the furnace side. If retorts should happen to be badly worn, furnace gas, with sulphur dioxide, would get into the coal gas. With the retorts in good condition, however, there is no difficulty in keeping below the 25 grains. During the inspection of the purification plant, a man was not seen about it. With it, the charges for labour are *nil* sometimes for weeks together; and at other times they are very light indeed.

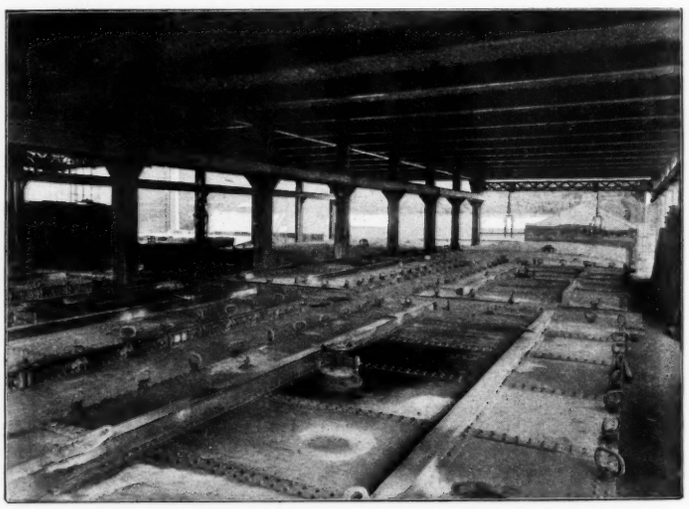
Well now as to the structure. The information has been given that it is a fine open building, only shielded by brickwork at the front end. The figures cited as to its dimensions will have revealed its large proportions, and above the photograph showing the walled end of the building, with its large elevator inclining up the outside, will enable the reader to appreciate that this is not by any means a common type of purifier-house. The house is built in three bays—one 48 feet, and two 32 ft. 6 in. Detail, however, as to the steel structure put in by the Horseley Company is scarcely required; besides, in order to thoroughly describe the whole would lead into a complicated mass of figures that would not be fully appreciated. Stanchions, columns, and girders forming the supporting structure for the purifier-floor and the oxide-floor above, as well as the roof principals, &c., are all of substantial build, and the whole forms a piece of work that has a pleasing effect upon the engineering eye.

With regard to the purifiers, the new boxes and the re-erection work was the contract of Messrs. Newton, Chambers, and Co., Limited. The new purifiers consist of four of the luteless type, each 30 ft. square by 5 ft. 6 in. deep. Each purifier is furnished with two covers, 25 ft. by 10 ft., with rubber jointing and holding-down bolts; so that there is only 2 ft. 6 in. of decking all round. The purifiers are fitted with four tiers of wood grids, have 18-inch connections, and a Weck centre-valve. Beyond these are four 24 feet square purifiers which formed part of the old plant, and were taken down and re-erected in the new building; being fitted with new covers, grids, 18-inch connections, and two two-box Weck valves. These four 30 feet square purifiers and the four 24 feet square, form the coal-gas plant. For these, new travelling apparatus for lifting the covers has been provided. From the Palace works, the contractors brought, and they are now arranged alongside the plant just described, four purifiers, 36 ft. by 24 ft. by 5 ft. deep, which are being used for the water-gas purification. They have been fitted with new 18-inch connections and a Weck valve; but the old Goliath has been retained in service for lifting the covers. When an opportune time arrives, the purifiers will be converted to the luteless system. In these water-gas purifiers, oxide of iron only is employed; and there has not been one of them changed for twelve months, though in the time 35 per cent. of the total output—or something like 180 millions—has been carburetted water gas.

The purifier-floor and top oxide-floor are reached by outside stairways; and ascending to the top floor, as may be imagined, it is found to give plenty of working area. The oxide is raised to this upper floor by the large elevator—62 feet from centre to centre—shown in one of the photographs; and this delivers the oxide on to distributing belt conveyors in the roof. All the elevating and conveying work is by Messrs. W. J. Jenkins and Co. It is interesting, as showing the great advantage of the new plant as against the old, to learn that it used to take twelve men two-and-a-half days to empty and fill one of the old boxes; and now one of the 30 feet square purifiers is emptied and filled by the aid of the machinery and the work of eight men easily in a day of twelve hours. The maximum use is got out of the plant, by shutting a box off one day and putting it on again the next. The house certainly offers several points of interest over which one is tempted to linger.

Other Rearrangements.

In the reorganization of the Bishop Bridge station, Mr. Glover has, it is plain, aimed at making the utmost use of the space and buildings at his disposal. The fabric of the old retort and purifying houses is too good to be destroyed, though the buildings are too small, and of no use under the scheme, for their original purpose. But Mr. Glover is already contemplating bringing them again into service in other directions; and the time is probably not far distant when the old purifying-house will be utilized for a sulphate-house. Looking round the smaller buildings bordering one side of the site, we are reminded once again that the progress of time has brought many changes besides within the manufacturing part of the works. Every gas-works has now to provide workshops not only for internal requirements, but the needs of the districts require provision for repairs and stores to an extent that at one time would have been thought impossible. A small part of a long range of low-pitched buildings at this station satisfied the needs in these respects of a past day; the whole of the range is now occupied, and the requirement threatens to outgrow the accommodation. Stepping in, men are seen busily passing old dirty stoves and other kitchen apparatus through the caustic soda baths, and turning them out eventually, bright, clean, and apparently quite equal to new. Of course, the work of a district entails a great cost now compared with former times; and in the stores this is again seen in the hundred-and-one different kinds of fittings and the large stock of meters and services which both the ordinary and the prepayment systems of supply demand shall be kept. Outside this range of workshops, in which work is going along so briskly, it is mentioned by Mr. Glover that underfoot was an old gasholder tank dating back to 1824, and now used as a liquor well.



Interior of the Purifier House—Bishop Bridge Gas-Works.

A hasty glance at the naphthalene dissolving apparatus, and through the well-equipped laboratory and photometer room completed the visit to the Norwich works. From what has been written, it will be seen that the day was full of interest, and in that interest we think most of our readers will not fail to share by the perusal of the notes with which they have been presented in this article. It only remains for us to thank Mr. Glover and his chief assistant (Mr. Moon) for their kind attention, and for the facilities afforded in the preparation of this descriptive account of a most interesting and, in important respects, novel gas-works reconstruction scheme.

THE DESSAU VERTICAL RETORT.

THE German Continental Gas Company, on the 20th inst., welcomed to their headquarters at Dessau some eighty guests, who had been invited to witness the working of the settings of vertical retorts which had been erected there to the design of the Company's Chief Chemist, Dr. J. Bueb. The visitors included such well-known authorities on the technology of gas manufacture as Dr. H. Bunte, of Carlsruhe, and Professor Lunge, of Zürich, as well as the Managers of the gas-works of the more important towns in Germany and adjoining countries. In the afternoon, the visitors assembled in the large hall at the Company's offices, and the distinguished General Manager, Dr. W. von Oechelhaeuser, in a few well-chosen words, introduced to them Dr. J. Bueb, who then furnished an account of his system of vertical retorts, and the results already attained with it. We give below a translation of Dr. Bueb's communication.

DR. J. BUEB'S DESCRIPTION.

The advances made in the gas industry during the last twenty years have been for the most part in the fields of gas purification, gas lighting, and methods of conveying coke and coal. On the other hand, gas production itself has not undergone any radical changes in the same period. For a time it looked as though the inclined retorts which were introduced by Coze were destined to supersede the old horizontal retorts; but the latter have, by the aid of improved apparatus for drawing and charging, not only maintained their position alongside inclined retorts, but have indeed considerably strengthened it. Also the endeavours which emanated from America, to introduce the so-called coke-ovens in place of the retort-settings in gas-works, have not attained any practical result. This failure is mainly due to the long period of carbonization to which the coal is exposed in a coke-oven.

The German Continental Gas Company followed these novelties in gas manufacture with the greatest care, and even went so far as to practically test this last new process of gas production. In this connection, as a result of the author's observations of the large coke-oven gas-works at Everett, near Boston, a setting was established for some time at the Dessau Gas-Works. Its method of working consisted in gasifying powdered coal in a large retort-shaped vessel of rectangular cross section, of about 1 ton capacity. The time of carbonization, owing to the change of shape of the retorts and of the increased temperature, was considerably reduced in comparison with that necessary in the ordinary coke-oven. Notwithstanding satisfactory practical results with this setting, the system was not further extended because the experiments undertaken by us shortly afterwards with vertical retorts appeared to be so much more promising. We foresaw in this new system the future of gas manufacture.

The production of coal gas in vertical retorts is such a natural process that it was considered at the very start of gas manufacture. One involuntarily asks what reason has hitherto prevented the application of the vertical retort in the gas industry. In my opinion, there are two circumstances chiefly which have hitherto made the vertical retort appear impossible as an apparatus for gas production. The first is the view (widely disseminated among gas men) that gas coal, in consequence of its property of swelling when heated, requires a free space for expansion in the retort. The second reason is the fact, which was regarded as established, that the gas produced in a vertical retort as it rose through the already carbonized and red-hot material would be exposed to strong decomposition, whereby its most valuable illuminants would be destroyed.

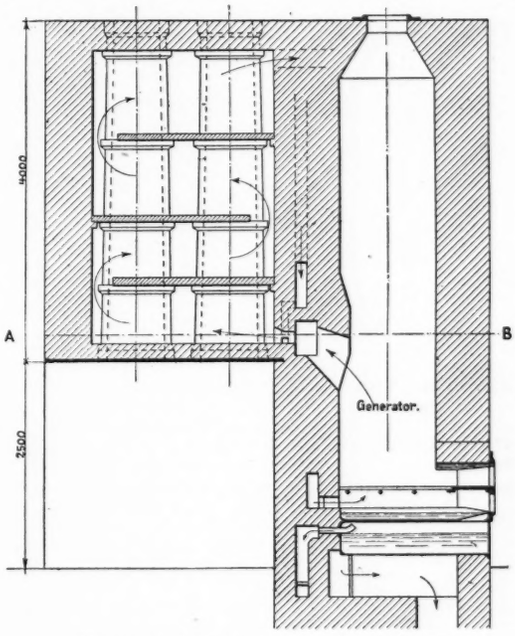
After we had, in the first place, established by practical trials that the application of high temperatures in the vertical retorts was not accompanied by any swelling of the coal, nor consequently by any pressure on the walls of the retort, the first experimental setting of vertical retorts was put into operation at the Dessau Gas-Works in 1903. The chief feature of the retorts in this setting was the lateral carrying away of the gas throughout one of the longer sides of the retort into a chamber removed from direct heating.* The setting comprised six retorts, and it remained in working for a long time. Quite satisfactory results were attained with it. In the construction of this setting, we took the view that the gas made must be removed from the retort as quickly as possible after its production, and by the shortest route, in order that the decomposition of the illuminants might be avoided. The carrying off of the gas from one side of the whole length of the retort had the natural disadvantage that the retort could only be heated on three sides; and this was unfavourable, so far as the consumption of fuel was concerned. Experiments which we subsequently carried out on this retort with the lateral exit consisted in bricking up the lateral outlets and leading off the gas from the top of the retort. These experiments were so far satisfactory that they showed that the anticipated decomposition of the heavy hydrocarbons by the passage of the gas through the charge could be avoided if the heating of the retort was carried out in a particular manner, and certain other conditions were fulfilled. These experiments were continued until the fact that the illuminants of the gas were not decomposed had been established with certainty in every direction, and the various conditions to be maintained had been clearly ascertained.

* See "JOURNAL," Vol. LXXXVI., p. 579; and Vol. LXXXIX., p. 28.

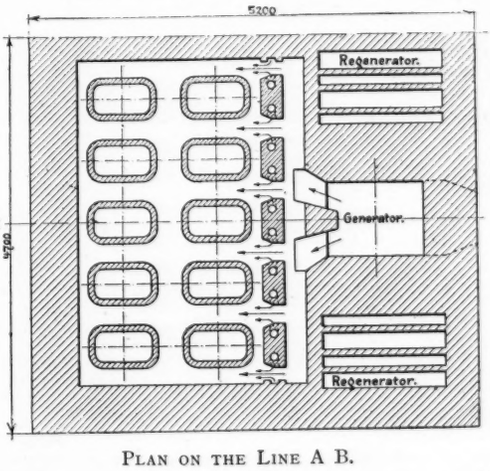
The experience gained experimentally—that, by a suitable method of working, decomposition of the heavy hydrocarbons in the vertical retorts did not occur—was profited by in constructing a setting of such retorts in a new and greatly simplified manner. Nevertheless, we had to rebuild our experimental setting five times in the course of the last two years, before we finally succeeded in erecting one which behaved well in every respect in practical working. The final result of this long-continued work is to be found to-day in the two settings of vertical retorts in the new retort-house at the Dessau Gas-Works. The well-known and unfortunately too early deceased Gas Engineer, Mr. E. Drory, and his former Assistant and present successor, Herr E. Körting, took a leading and energetic part in this work for one-and-a-half years.

DESCRIPTION OF THE SETTING.

The construction of the setting can be at once followed from the accompanying illustrations. The setting consists of ten retorts 13·1 feet long, which stand exactly vertical. They are heated by a generator placed in the middle of the longer side of the setting, and the regenerative arrangements are on both sides of this generator. A conveying trough runs directly under the retorts themselves, for the purpose of receiving the coke discharged from them and removing it from the retort-house. The

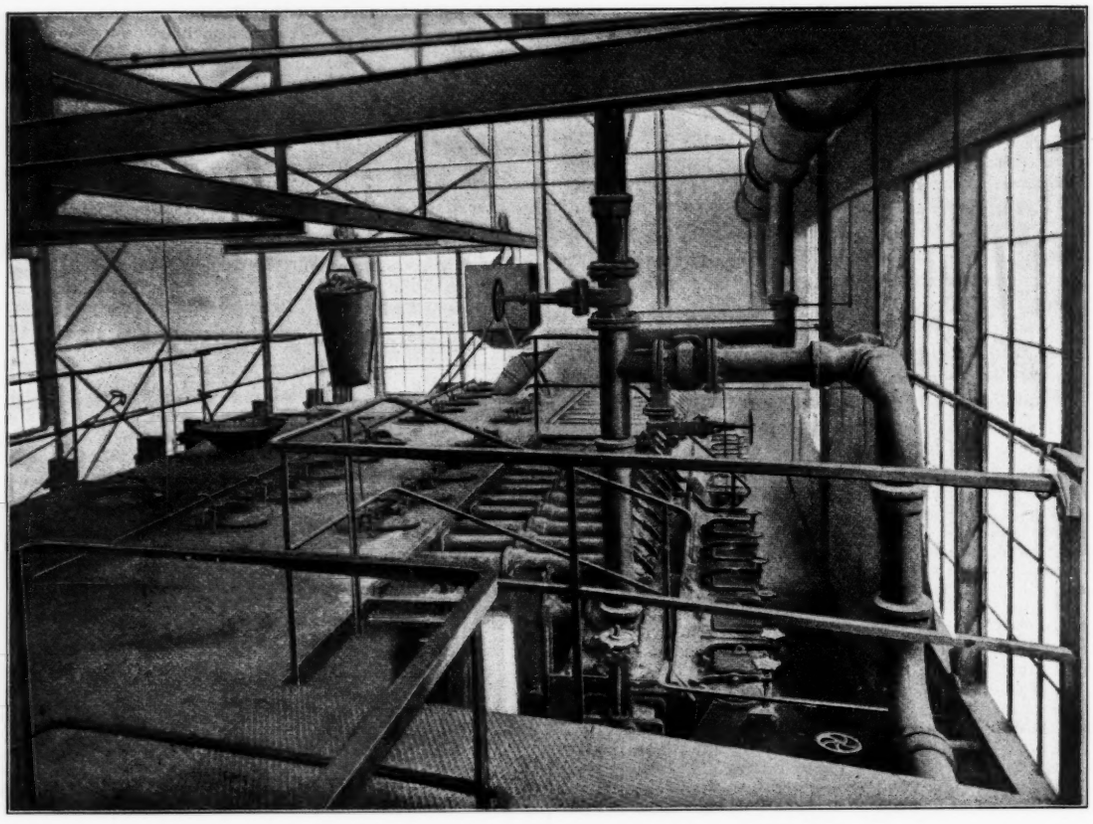


VERTICAL SECTION ON THE LINE C D.



PLAN ON THE LINE A B.

setting satisfies the most exacting requirements in regard to economy of heating. The total loss of pressure is only about 3-10ths. Notwithstanding the very high internal temperature, which at first is 1400° C., the spent gases leave the setting at a temperature of only 280° to 350° C. The generator is constructed of such a size that it takes at one charge sufficient coke for heating the setting for 24 hours. Clinkering of the setting is carried out once in 48 hours, and occupies about half-an-hour. The



Charging Floor of the Vertical Retort-House.

regeneration is very simple and thorough. The whole setting likewise is capable of ready control of its temperature and gas making. The method of heating is a natural one, as the heating gases rise upwards in the setting and are led directly from the upper part through the regenerative passages to the base. The retorts are closed below in such a manner that an attendant can open and shut all the mouthpieces from one place outside the setting. The retorts are charged from suspended trucks travelling above the setting.

Working Data.

The charge per retort amounts to 10 to 11 cwt. Only coal that has been through a coal-breaker is used. The time of working off under normal conditions is from 8 to 10 hours, according to the description of coal. The capacity of each retort is about 14,120 cubic feet per 24 hours. The make of gas varies, according to the description of coal, from 11,124 to 11,842 cubic feet per ton. The illuminating power of the gas is not appreciably higher than with horizontal retorts.* The calorific power varies, according to the description of coal, between 573 and 607 B.T.U. per cubic foot at 60° Fahr. and 30 inches bar. The yield of coke from Westphalian coal, in June, 1905, was about 71 per cent. The quality of the coke was considerably better than that obtained from the same coal in horizontal or inclined retorts. It was denser, harder, and in larger pieces, so that less waste ensued on its manipulation. The following are particulars of the coke made during the month of June:—

Large coke	77·9 per cent.
Small coke, No. 1	11·7 ,,
,, ,, No. 2	6·6 ,,
Waste breeze	3·8 ,,

The consumption of coke in the generators, when the settings were in full work, amounted to 14 per cent. of the weight of the coal carbonized, when that coal had a normal proportion of 6 to 8 per cent. of ash. This was with settings as now constructed.

* The illuminating power of the gas was determined in both flat-flame (batswing) and argand (? Elster) burners at a fixed rate of consumption in each case of 5·3 cubic feet (150 litres) per hour. The averages for the month of August were, for the flat-flame burner, 11·39 candles, and for the argand 13·40 candles. The daily results from which these averages are deduced are given in the following table:—

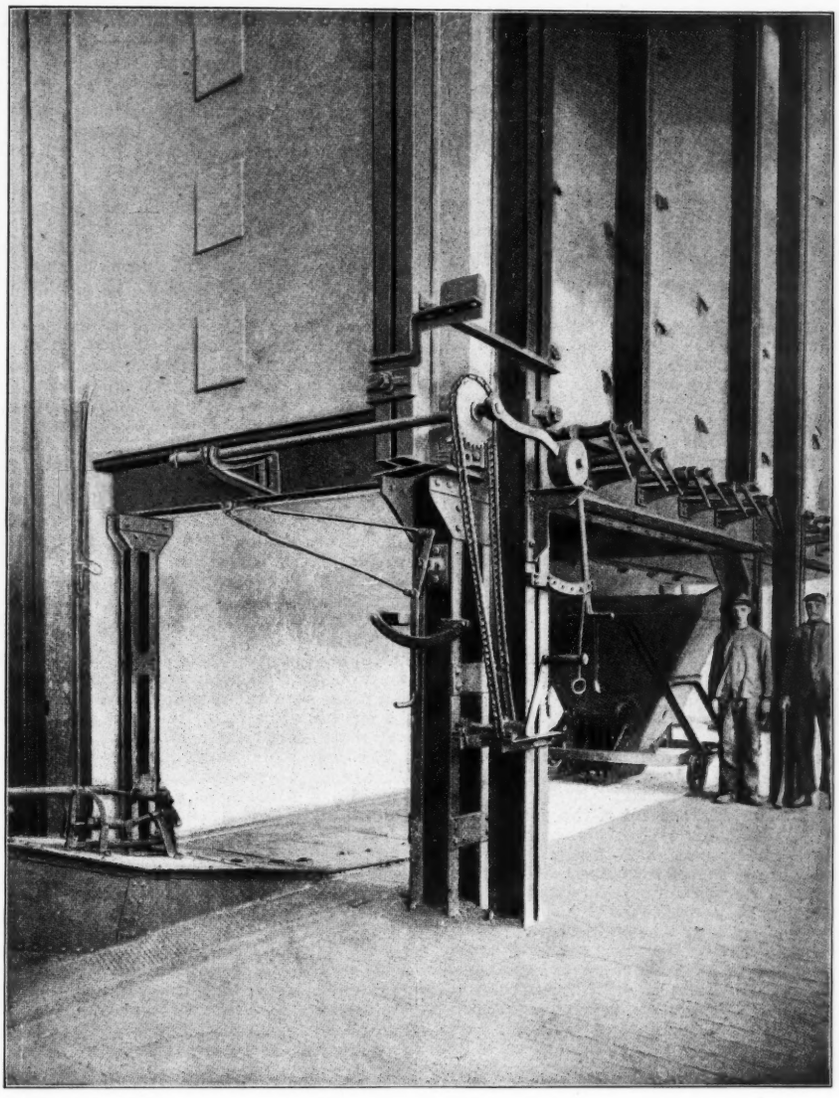
Date. 1905.	Flat-Flame. Candles.	Argand Candles.	Date 1905.	Flate Flame. Candles.	Argand Candles.
Aug. 1	11·40	13·51	Aug. 16	10·53	13·42
,, 2	11·49	12·81	,, 17	11·25	13·95
,, 3	11·14	13·15	,, 18	11·94	13·86
,, 5	10·52	13·51	,, 19	10·87	13·59
,, 7	12·81	13·07	,, 21	12·02	13·42
,, 8	10·35	13·34	,, 23	10·70	13·07
,, 9	11·14	13·42	,, 24	11·49	13·51
,, 11	13·06	14·04	,, 25	11·34	13·25
,, 14	11·14	12·89	,, 29	11·49	13·42
,, 15	10·35	13·34	,, 30	11·58	13·51

The yield of ammonia is considerably higher with the vertical retort. With Westphalian coal, during the month of August, the ammonia recovered in the gas liquor amounted to 0·373 per cent. of the weight of coal carbonized. The yield of cyanogen is about 40 per cent. lower. The yield of tar is somewhat higher than with horizontal settings. It amounted in June to 5·6, and in July to 5·8 per cent. of the weight of coal carbonized. The tar made by our vertical retort process, however, has an entirely different composition from that obtained from the same coal in the ordinary retorts. This difference was obvious from the fact that the tar from the vertical retort is a thin brown oil, containing only 2 to 4 per cent. of free carbon; whereas the tar made from the same coal in horizontal or inclined retorts is highly viscous and black, and contains upwards of 20 per cent. of carbon. The specific gravity of the tar is about 1·1, as compared was 1·2 for the former tar. The following are details of a distillation of the tar from English coal (New Leverson and Leverson-Wallsend), as carried out in our Warsaw Tar-Works:—

	Vertical Retorts. Per Cent.	Horizontal Retorts. Per Cent.
Ammoniacal liquor	2·17	3·50
Light oil	5 85	3·10
Middle oil	12·32	7·68
Heavy oil	11·95	10·15
Anthracene oil	15·96	11·54
Pitch	49·75	62·00
Loss	2·00	2·03

The difference in the quality of the tar is apparent from this comparison of the results with ordinary English coal tar. The proportion of naphthalene in the tar from the vertical retort is about 50 per cent. less than in that from the horizontal retort with the same coal. There is no doubt that this new tar is a considerably more valuable material than the old. The proportion of naphthalene in the gas produced in the vertical retorts is about 50 per cent. less than in ordinary coal gas. This must be traced to the fact that in the vertical retort naphthalene formation occurs in a much smaller measure than in the horizontal retort.

The two vertical settings, each of ten retorts, require only two attendants. The charging of the setting is carried out in the following manner: The attendant on the upper floor opens and closes the upper lid of the retort, runs the coal from the bunker into the suspended waggon, and charges the retort. The attendant below the settings has only to open and close the lower mouthpieces, and to move the travelling hopper beneath the retorts which are being discharged. The two attendants further look after the removal of the coke from the receiver to the yard and to the clinkering. The workmen have a rest of two hours, when attending two settings, between every charging of five retorts at a time, which takes about eight or ten minutes. They could therefore without any difficulty attend to two more settings; but



Discharging Floor of the Vertical Retort-House.

then the manipulation of the coke in the yard would have to be looked after by another man. Our vertical retort system, therefore, admits of a make of over 140,000 cubic feet for each attendant employed. The work of the settings is very easy, as the conveying of the coal and coke is effected mechanically.

The vertical retort-settings as erected at Dessau occupy an area of 1883 square feet. This includes the coal and coke conveying plant, as well as the two settings, each of ten retorts. A setting of ten retorts requires, on an average, 14¾ feet length of retort-house. If the retort-house is 36 feet wide, the area per setting, including the stage, amounts to 532·8 square feet. On this area, over 140,000 cubic feet of gas can be produced. If, however, the retort-house is 39 ft. 4 in. wide, the area per setting becomes 581·3 square feet.

The extension of the retort-house, which will be carried out next spring, by an addition of four settings, will raise the productive capacity of the house to a maximum of 848,000 cubic feet, and the area covered will be 4262 square feet. The height of the retort-house to the rafters is 32·8 feet. Nothing can be said definitely at present as to the durability of the vertical retorts; but there seems little doubt that, with proper heating, they will last at least as long as horizontal ones. The settings at Dessau were of such a size that they contained ten retorts, each 13·1 feet in length. Such a setting, having a capacity of more than 140,000 cubic feet per diem, corresponds with the requirements of moderate size gas-works. For larger works, however, still greater units should be aimed at, and, in my opinion, would prove successful. At the Mariendorf Gas-Works, near Berlin, of the Imperial Continental Gas Association, experiments are being made at the present time with a vertical setting, according to our system, of twelve retorts, each 16·4 feet long. These trials, however, have not yet been completed, as the greater length of the retort entails some changes in the heating arrangement.

In the experimental plant at Dessau, a large number of varieties of coal have so far been carbonized. Among others may be mentioned some common Westphalian coals, such as Dahlbusch, Mont Cenis, Pluto, Hugo, Schlägel, and Eisen; and also the following English coals: New Leverson, Leverson-Wallsend, New Pelton, Pelton Main, Boldon, and Hebburn Main. Further, some Saar coal, Russian Donez coal, and Upper Silesian coals have been tried. All these varieties have been carbonized quite well in the vertical retorts, with the single exception of the best Upper Silesian gas coal, which, in consequence of its great tendency to swell, remains suspended in the retort. It has been established by the trials that coals which, on carbonization in horizontal or inclined retorts, yielded coke of an unsatisfactory quality, would produce in the vertical retort a quite good coke. Thus, in the future, owing to the vertical retort, the gas manager will be still less dependent on so-called gas coal.

The temperature at which the vertical settings are worked is not inconsiderably higher than the normal temperature of an ordinary gas setting. The foregoing results, which show that the gas produced in the vertical retort contains much less naphthalene than ordinary coal gas, and that the tar has a more oily consistency and is nearly free from carbon, appear at first sight to be in conflict with the high temperature of the setting. Previous experience in gas manufacture has always shown that the illuminating power of the gas diminishes with increase in the temperature of the setting, while the proportion of naphthalene is raised, and the tar becomes more viscous and richer in carbon. The different results obtained with the vertical retort, however, find natural explanation in the fact that, notwithstanding the high a temperature of the setting, the gas and tar produced are not exposed for so long to such high degrees of temperature as with horizontal or inclined retorts.

The course of carbonization, after the vertical retort is charged, is as follows: The coal lies at first tightly pressed from above against the strongly heated walls of the retort. An intensified carbonization ensues on the outermost layer of coal, which causes the coke, in consequence of the compression which it

suffers through the weight of coal and the swelling, to acquire a very close consistency. Thus this coke becomes much less permeable to gas than the still uncarbonized layer of coal towards the middle of the retort. The gas evolved on carbonization will seek the way of least resistance; and so passes into the middle of the retort. The following is a tabular statement of the temperature as measured in the innermost core of the retort :—

Time after Charging.	Deg. C.	Time after Charging.	Deg. C.
½ hour	90	5 hours	440
¾ ,,	105	6 ,,	470
1 ,,	145	7 ,,	500
2 ,,	200	8 ,,	580
3 ,,	280	9 ,,	620
4 ,,	370		

It is plain from this that a relatively cold core of coal continues to exist in the interior of the retort nearly up to the end of carbonization, and that this core serves at the same time as an exit passage for the gas and tar evolved by the carbonization of the coal. The carbonization and gasification of the coal proceed perfectly concentrically. The evolved gases and tarry vapours are forced into the interior of the charge, and rise in the core of the coal. The rate of flow of the gas in the retort is therefore relatively very high, because there are no free spaces within the vertical retort as there are in the horizontal or inclined retort. There are only the spaces intervening between the pieces of coal left available for the passage of the gas. In my estimation, the gas made in the vertical retort remains there only one-fifth part of the time that it is detained in the horizontal retort. Consequently, the gas leaves the vertical retort at a relatively low temperature. The following tabular statement shows the temperature of the gas as it escapes from the retort at each hour throughout the period of carbonization.

Time after Charging.	Deg. C.	Time after Charging.	Deg. C.
1 hour.	190	6 hours	215
2 ,,	310	7 ,,	213
3 ,,	315	8 ,,	210
4 ,,	318	9 ,,	205
5 ,,	217	10 ,,	188

Thus, while a temperature of 1300° to 1400° C. prevails in the setting, the escaping gases are heated at the most to slightly above 300° C.

In our system of vertical retorts, contact of the gas or tarry vapour with highly heated surfaces is avoided; whereas with the horizontal and inclined retorts, the gas and tarry vapours must pass along the extremely highly heated incandescent surfaces of the retorts, and there suffer decomposition. The carbon of the tar, which gives rise to the very objectionable phenomenon of thickened tar, arises solely from such decomposed hydrocarbons. The highly heated surfaces with which the gas and the tarry vapours come in contact, are likewise the cause of naphthalene formation under the old system, as the heavy hydrocarbons, such as benzene, are decomposed by superheating into naphthalene. The avoidance of the destructive superheating of the gas produced in the retort also affords a natural explanation for the increased yield of ammonia and the decreased yield of cyanogen. The chief thing of all in the working of our vertical retort system, if the foregoing results are to be obtained, is to completely fill the retort with coal, so that there is no hollow space above, below, or at the sides.

Conclusion.

The gas requirements of the town of Dessau and its suburbs, having a population in the district supplied of 65,000, have been met, since June 1 last, entirely with gas made in the two vertical settings. Appended is an abstract from the works returns for the past three months:—

		June.	July.	August.
Coal carbonized	tons	540	584	605
Gas made	cub. ft.	5,975,770	6,585,650	6,873,100
Make per ton of coal	,, ,,	11,052	11,268	11,375

From this abstract it is evident that the two Dessau settings could not be worked to their full advantage in the months of June and July; but it serves to show the power of accommodation of the settings to variations in consumption. The varying conditions of consumption were very readily met, though the yield per ton was unfavourably affected by these fluctuations. The yield was considerably better when the consumption increased.

In the whole period of three months' working at the Dessau Gas-Works, not a single untoward incident has occurred; so that we are now able to bring before the public and recommend the settings as trustworthy and well tried in working.

The "Life" of Radium.—In the "Journal" for the 12th inst., we gave an extract from the second part of the Presidential Address of Professor Darwin, at the recent meeting of the British Association in South Africa, showing the extraordinary potentiality of radium. It will be of interest, therefore, to supplement the figures then given by others bearing upon the "life" of this remarkable substance, which, according to the "Electrician," has been re-determined by Professor Rutherford, of Montreal, on the basis of the number of charged particles expelled per second. He finds that 1 gramme of radium at its minimum activity expels $6{\cdot}2 \times 10^{10}$ α-particles per second. Since probably only one α-particle is expelled during the disintegration of the radium atom, the above number represents the number of radium atoms broken up per second per gramme.

WORKMEN'S COMPENSATION STATISTICS.

The recent discussion over the necessity for amending the Workmen's Compensation Acts will in all probability cause an even more than usual amount of attention to be given to the statistics issued last week by the Home Office with regard to proceedings during the year 1904 under the Workmen's Compensation Acts and the Employers' Liability Act. The details have been prepared in the same form as in preceding years; and the tables comprised in the return give all the statistical information which is available in regard to the operation of the Acts in question. It is once more pointed out that the statutes themselves contain no provision for the making of returns to show the working of the systems of compensation which they established; and that the limited sources from which particulars are thus obtainable leave untouched the great body of cases. In the majority of instances, of course, compensation is settled by agreement, and no memorandum is registered, so that no official information is available. It is, however, possible to get from the Registrars particulars of cases which came before the County Courts, as well as of the small number in which memoranda recording agreements come to or awards made by private arbitrators under the Compensation Acts are registered. Then certain information regarding the cases carried to the Court of Appeal can be supplied by officers of the Supreme Court, particulars of all official references to Medical Referees are available in the Home Office, details as to certified schemes are obtained from the Chief Registrar of Friendly Societies, and certain information as to the charge incurred by railway companies for compensation is available in the returns made by them to the Board of Trade. Now let us see what is to be gathered from the statistics which have been compiled from the sources enumerated—noting that the figures, unless otherwise stated, refer only to England and Wales. The Scotch statistics show, on material points, results so different from the English, that it has been considered better to treat them separately; while the number of cases in Ireland is so small that they would not materially affect the general totals.

The first table shows that the number of cases under the Workmen's Compensation Acts dealt with by County Court Judges and Arbitrators was 1730—the largest number yet recorded, and about 300 more than in the previous year. The number decided by Judges was 1466, by Special Arbitrators 81, and by acceptance of money paid into Court 183. It should be remarked that, in addition to the cases actually dealt with by County Court Judges and Arbitrators, there were 705 withdrawn, settled out of Court, or otherwise disposed of in such a way as not to enable the officials of the Court to definitely state the results. Of the claims for compensation finally settled during the year within the cognizance of the Courts, the decision in 1207 cases was in favour of the applicant, and in 269 in that of the respondent; the proportion of instances in which the applicant was successful being thus 82 per cent., as compared with 84 per cent. the preceding year. In 557 cases the award was a lump sum; and in 650 a weekly payment. In 452 cases, the compensation was awarded on account of death; and in all of them the deceased had left dependants. A table is given of the number of instances in which compensation was awarded in case of death in each of the six years during which the Act has been in force, together with the total and average amounts of the awards. The total sum so awarded last year—£80,231—was greatly in excess of that for 1903 (the number of cases having been 452, compared with 323); but at the same time the average amount shows a reduction of but a few pounds—being £177 10s., against £181. Coming to the grants of compensation for injury, there were 105 cases (compared with 122 in 1903) in which the compensation consisted of a lump sum. In 32 of these, the plaintiff accepted money paid into Court, while in the majority of the remaining instances a lump sum appears to have been awarded by consent of the parties. The average amount was £34 12s. 8d., which is a substantial increase over 1903, when the figure was £27 18s. 3d. In 650 cases of injury a weekly sum was assigned—409 being instances of total, and 241 of partial, incapacity. The average amount of these weekly payments has varied very little during the time the Act has been in operation. Last year the average was 11s. 9d. a week for total, and 10s. 8d. for partial, incapacity. The total number of cases taken into Court—whether dealt with by the Court or otherwise disposed of—under the various employments to which the Acts of 1897 and 1900 refer was 2435 last year, as against 2033 the year before. As already pointed out, the great majority of cases are settled by agreement in such a way that particulars are not available; but in a certain proportion of instances memoranda are registered in County Courts which afford information as to the terms arranged. The number of these cases last year showed a considerable increase (3625, against 2995 in 1903); and it appears that the average compensation to dependants awarded in cases of death and the average weekly payment in those of incapacity were £151 7s. 5d. and 12s. 11d. respectively.

Coming to the Employers' Liability Act, we find that there has been little change in the number of actions brought under this statute since the passing of the Compensation Acts. Last year the number of cases was 598, as compared with 581 in 1896; though, of course, there have been somewhat wider fluctuations in the intervening years. Of last year's actions, 158 resulted in

judgment for the plaintiff, 86 ended in favour of the defendant, one was removed to the High Court, and more than half the total—353—were "otherwise disposed of." Though the number of cases where the plaintiffs succeeded was greater by 33 than in the previous year, the total amount of damages awarded was only £12,087, as compared with £13,247. In 37 out of the total of 598 cases, though the proceedings were originally taken under the Employers' Liability Act, the question of compensation was actually determined under the Compensation Act, 1897. The average amount of damages, in case of death, recovered under the Employers' Liability Act is considerably less than the average amount of compensation awarded in similar cases under the Workmen's Compensation Acts; the figures being £118 5s. 4d. and £177 10s. 11d. respectively. This has been the case in each year since the passing of the Compensation Acts, with the exception of 1903, when exceptionally heavy damages were accorded in three cases at Dudley. And while the average sum recovered under the Employers' Liability Act was so much less last year than the amount awarded under the Compensation Acts, the average solicitor's bill was considerably more; the figures being £24 11s. 9d. and £13 0s. 2d. The tendency in the Metropolitan Courts to proceed under the Employers' Liability Act in preference to the newer statutes is still marked.

It is, of course, only to be expected that, as the knotty points of the Compensation Acts are gradually unravelled by the Judges, the number of actions carried from the County Courts to the Court of Appeal would diminish. This has proved to be the case; for the number last year was only 34, as compared with 90 in 1900. Of last year's number, 12 were appeals by workmen and 22 by employers; six of the former and five of the latter being successful. There were two appeals to the House of Lords—both by workmen, and both unsuccessful. Looking at the Scotch returns, it is seen that the number of cases taken into Court during 1904 under the Compensation Acts was 64 per million of population, as against 72 in England; but the amount of litigation under the Employers' Liability Act was greater in Scotland—32 per million of population, compared with 18. Scotland also remains ahead in respect to the proportion of appeals. Reckoning all the cases taken into Court, however, the Scotch workman has been much less successful than his English brother. In England, 82 per cent. were settled in favour of the workmen; while in Scotland the figure was only 64 per cent. In Ireland, there were only 221 cases under the Compensation Acts and 14 under the Liability Act; but these furnished material for no less than eleven appeals. On June 30, 1904, there were 52 certified schemes of compensation in operation in England; but these are, of course, dealt with each year in the report of the Chief Registrar of Friendly Societies. The number of men affected by these schemes is, however, given in the returns under review as 114,648.

OBITUARY.

Mr. RICHARD ASHTON, who was for many years associated with the Barnstaple Gas Company, first as Secretary and then as Secretary and Manager, died on Wednesday last, at the age of 71 years. He was a native of North Devon, having been born at Clovelly, and in his early life was engaged in a solicitor's office, and then as clerk in a factory at Barnstaple. On the formation of the present Barnstaple Gas Company, in 1868, he was appointed Secretary, and on the retirement of Mr. W. C. Rafarel he took over also the duties of Manager. In both capacities Mr. Ashton worked very zealously; and the business prospered greatly under his control. After 35 years' service, he retired about four years ago. Apart from his connection with the Gas Company, Mr. Ashton was one of the best-known men in North Devon. He took a very active part in the public affairs of Barnstaple. For more than thirty years he was a member of the Town Council, and at the time of his death was an Alderman of the borough. On two occasions he was elected Mayor, and had filled many other offices, including that of Overseer of the Poor. He was also a Magistrate. Among other things for which the town was indebted to him was the establishment of technical schools and the provision of a public park and pleasure-ground. His death is a distinct loss to the town and neighbourhood with which he was so long honourably associated.

A vacancy has been caused on the Board of the Maidstone Gas Company, as well as on that of West's Gas Improvement Company, by the rather sudden death of Mr. WILLIAM EDMETT, a well-known townsman of Maidstone. Deceased had just returned to his residence at Tunbridge Wells from a holiday passed at Eastbourne; and on the night of Monday, the 11th inst., he complained of illness. Medical aid was sought; but it was unavailing, and the unfortunate gentleman succumbed on Tuesday morning to an affection of the heart. He was the son of the late Alderman Edmett, who had a large business in the High Street, and was born in Maidstone 66 years ago. Inheriting a fortune from a relation, he left his father's business; and being of a retiring disposition, he never aspired to municipal honours, though his father was twice Mayor. He was, however, for several years a Justice of the Peace for the borough. He was on the directorate of the above-named Companies for about 18 years. He took a great interest in philanthropic work, and was a most beneficent man; helping, in his own quiet way, many deserving charities and individuals. He will be greatly missed by numerous friends, and by those who have benefited by his generosity. The funeral took place on the 16th inst.; among those who attended it being Mr. John West and Mr. Fred West, of Manchester, Dr. C. Hoar and Mr. W. Bryant (Directors), Mr. R. Hoar (Solicitor), and Mr. Hickmott (Collector), of the Maidstone Gas Company. Deceased leaves a widow, two sons, and one daughter.

Use of Gas for Motive Power in America.—"The development of the gas-engine has proceeded at a much more rapid rate on the other side of the Atlantic than with us," says the "Iron Age." Figures showing the consumption of gas from city plants give a good idea of this. In many German cities, 15 to 25 per cent. of the total gas made is consumed by engines; while some 5 per cent. of the total output of the Paris Gas Company is utilized in the same way. In American cities scarcely an example can be found where as much as 1 per cent. of the total gas manufactured is supplied for working engines.

Strange Use of Lamp-Posts.—In connection with a street-widening scheme in Plymouth, the Corporation have decided to extend their electric lighting system, and arc lights are to take the place of four gas-lamps in Old Town Street. The change has, it is said, been made at the request of the shopkeepers, who certainly have cause for complaint of the manner in which the Corporation have stinted the lighting of that thoroughfare, as they do of all the gas-lighted streets of the town. Now, however, the tradesmen have petitioned the Corporation to let the lamp-posts remain in order that they may be converted into stands for flowers. Those who have made the request promised to embellish the posts with plants and flowers, and apparently anticipate that they will be an adornment to the street. The Electricity and Street Lighting Committee of the Corporation have given their consent to the proposal; and it now remains for the shopkeepers to show that the posts can be put to effective use as adornments. Of course, one advantage of leaving the posts in their old position is that they will be available for lighting purposes if the Corporation should ever come to the conclusion that the best form of lighting is also the cheapest, even though it may seem like treason to municipal trading to admit it.

The Lambeth Water Company and their Employees.—In another part of the "JOURNAL" will be found a report of the proceedings at the meeting of the Lambeth Water Company last Friday, at which the final accounts were submitted to the proprietors. The proceedings do not call for special mention except on one point, and that is the decision come to in regard to the recognition of the services of the officers and workmen. It may be remembered that the Directors originally proposed to set aside £8000 for this purpose; but Mr. Justice Warrington decided that they had no legal power to do so. However, the Directors find themselves in possession of an unappropriated balance of about £500, and this they suggested should be distributed among eleven officers and workmen, eight of whom had completed forty, and three more than fifty years' service. The suggestion was agreed to; and it may be presumed that the proprietors left the meeting not only satisfied with the amount of the compensation secured for them—the "good bargain" to which the Chairman alluded—by the Directors, but with the pleasant feeling that they had adequately compensated employees whose long and faithful services had helped to place them in this happy position. True, a sum of £500 among eleven is not an overwhelming amount; but, unfortunately, this was all that was available from the funds. Of course, there is a way of increasing it, if a desire is felt to do so; but we will not venture to suggest it to the proprietors.

The "Hupright" Mantle-Rod.—Various devices have of late been introduced in the way of "improved" mantle-rods; but their use has generally ended in a return to the original type of support. Mr. Marquis Bibbero, who, towards the end of 1904, brought to our notice his dust-proof incandescent burner, calls attention to a new fire-clay mantle rod, for which a provisional patent has been granted to him jointly with Messrs. Holbrook and Co., of Hackney. Incandescent burners and mantle rods by different makers will not always mate well, with the result that it is frequently found that mantle forks are used that shake about in the rod-socket of the burner, and are the cause of bad light through the mantle being out of the vertical, and of the mantle fraying and breaking at the bottom. The samples of mantle-rods before us are intended to obviate this. In form, they are miniature eddystones; but the broad base is hollowed out, and is provided with a fluted copper pin which fits perfectly tight, and can be bent to maintain the rod perfectly perpendicular. Of course, a little adjustment is required in first fitting them to some burners; for instance, we find the pin too long and requiring a little filing down for various "C" burners. Not only has the broad hollowed base the effect of assisting to steady the support when once adjusted, but it acts as a flame-spreader inside the mantle, directing the flame well on to the sides of the latter. Another advantage is that the rod can be used for both long and short mantles, and so is equally suitable for the "C" or "Gem" type of burners. This convenience is obtained by an arrangement of double hook at the top; and as mantles have not been standardized in the matter of length for any class of burners, the value of the rod will be appreciated by users of incandescent burners, who, in trying fresh mantles, have often to break off a rod for short mantles, or get new rods for longer ones.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

Meeting at Cleethorpes.

The Thirty-Fourth General Meeting of the Association was held last Thursday, at Cleethorpes, under the presidency of Mr. R. G. SHADBOLT, of Grantham. The fixture was happily timed, inasmuch as this year the Vice-President of the Association (Mr. E. J. Brockway) is the Chairman of the Urban District Council; and it is almost, if not quite, a unique thing for an Association of Gas Engineers to have the pleasure of being received by one of their own number in the capacity of head of the governing body of a town. Mr. Brockway, too, in welcoming the Association, had the strong support of a Chairman and Board of Directors, who appreciate not only the work of their Engineer, but the value of the work of technical organization such as the Eastern Counties Association; and what they most generously did in the way of making the visit a memorable one marks that appreciation, and is a distinct encouragement to the members.

It was at the Dolphin Hotel that the members foregathered; and shortly after one o'clock they were entertained by the Chairman and Directors of the Company at lunch. The hosts were represented by Mr. David Smith (the Chairman), Mr. Markham Cook, Mr. John Locking, and Mr. Arthur Mountain (the Solicitor). It may be mentioned here that at the dinner in the evening these gentlemen were present, and were joined by their colleague, Mr. Stamper Anningson. That by the way. Returning to the luncheon, before it was served,

The CHAIRMAN, on behalf of the Cleethorpes Gas Company, offered the members a hearty welcome on their visit to the town. The Directors, he said, appreciated very much the kindness of the members in consenting to visit Cleethorpes and to partake of the Company's hospitality; and he hoped the meeting would result not only in their individual benefit, but in the benefit of the great industry with which they were all so intimately connected. He hoped, too, that the members would all of them derive some personal pleasure from the visit, and return home with happy memories of Cleethorpes.

After lunch, there was the loyal toast, and then

The PRESIDENT observed that there was an adage as to striking the iron while it was hot; and he meant to follow this idea out as closely as he could. They had partaken of a most excellent meal, under the most favourable of circumstances. Their hosts had entertained them not only well but pleasantly. He begged to propose briefly that the best thanks of the Eastern Counties Gas Managers' Association be accorded to the Chairman and Directors of the Cleethorpes Gas Company for the admirable manner in which they had entertained them.

Mr. J. CARTER (Lincoln) said it was a great gratification to him to have the opportunity of seconding the vote which had been submitted; and he would like to associate himself with every word the President had uttered. Covering, as the Association did, a very wide district—embracing the whole of the eastern part of the kingdom, from the Humber to the Thames—it was their privilege from time to time to meet in a large number of towns; and they had been received most kindly and most cordially in many of the larger as well as the smaller towns. But he did venture to say that, in extreme cordiality and in open-handed generosity, no reception they had had during their existence had exceeded their reception that day by the Directors of the Cleethorpes Gas Company.

The motion was carried by acclamation; cheers for Mr. and Mrs. Brockway being also given.

The CHAIRMAN, in replying on behalf of the Directors, said he had to tender to those present his sincere thanks for the kind and complimentary way in which the vote had been proposed and received. Before he took the chair of the Company's Board, their Solicitor said that probably he would find there was some responsibility connected with it. He was already beginning to feel the responsibility. He had not been Chairman of the Company very long; but since he was asked to take the position, he had found, as their Solicitor had said, that there was a great deal of responsibility attached to it. The responsibilities of life came to all of them; and they must take them and meet them the best way they could. He appreciated the visit the members had been pleased to pay them; and he trusted that it would be to the lasting good of the gas industry. When Mr. Brockway mentioned the matter of the visit some little time ago, the Directors felt it would be a great privilege to entertain the Association. If the members were satisfied and pleased with what the Directors had been able to do, that was all they looked for. It would give the Directors pleasure if they could, in the near future, meet the members once again. The Directors, however, had no right to all the praise; and he thought that they should have a few words from Mr. Brockway.

Mr. BROCKWAY, in complying with the invitation, observed that he appreciated highly the hearty cheers given for himself and his wife. He was delighted that the members had come forward and attended the meeting in such large numbers. It showed that the interest of the members in the works, and in what they were doing at Cleethorpes, was sustained, and that they expected they had something there to show them that would be of interest. Some of the members had already visited the works; and the others would, he hoped, do so after the business meeting. He could only say that he was not ashamed to show the members the Company's works. He was very proud of them; and his pride was in great measure due to the ability and the assistance of his Board, and the free hand they had at all times given him. As some of the members knew, the Company was a bold one. They took on the Dellwik plant in connection with the Peebles oil-gas process, and now they were taking on another process—the Settle-Padfield vertical gas-retort. This would be the first installation in the country. So far, the Company had never taken on anything in the way of a new process that had not proved a success. They believed the Settle-Padfield retorts would also be a success. He could only reiterate what his Chairman had said, that he hoped in the near future—when they had this system fully at work—that they might be able to ask the Association to visit them again.

THE BUSINESS MEETING.

A little later, the members assembled at the Council offices; and in the Council Chamber the meeting was held.

Mr. BROCKWAY, in virtue of his position as Chairman of the Council, welcomed the Association. He said that it was his privilege, and he felt it to be a very high honour, to be able, as Chairman of the Cleethorpes District Council, to accord to the members, as he did on behalf of the township, a cordial welcome. They were always glad to see visitors, because, like other summer resorts, their prosperity to some extent depended upon their visitors. But he did regard the visit of such a representative body as the Eastern Counties Association as a very high honour. He hoped that their meeting might be a profitable one, and the visit generally most pleasant. (Applause.)

CONDOLENCE WITH MR. DOUGALL.

The PRESIDENT (Mr. Shadbolt) said he deeply regretted, and he was sure the members also would regret, the circumstances which conspired to place him in the chair at that particular moment. Their esteemed President (Mr. J. S. Dougall), who was President until such time as he had inducted him (Mr. Shadbolt) to the chair in the ordinary course, had, as the members were all aware, been under a cloud for several months—a black cloud, and, as far as their human intelligence could discern, without a golden or a silver lining. He referred to the loss Mr. Dougall had sustained by the death of his wife, and which had been accentuated by the death of his father. No loss was so great to any man as that of his partner; and that, followed as it was in Mr. Dougall's case, by the death of his father, could have but the one effect of dejection and depression on the gentleman who had suffered from these bereavements. Mrs. Dougall was known to most of them—possibly, if one might express an opinion, better than any lady connected with the industry, at any rate in this particular district. They had all from time to time seen her untiring efforts for their comfort, and seen the way in which she had supported her husband in the discharge of his duties as President, and the hospitable manner in which she had met and entertained the ladies. He thought as an Association they would miss Mrs. Dougall, at any rate as much as, if not more than, any other lady who had the honour of being the partner of any of their members. Mr. Dougall, senr., was, of course, one of the old bulwarks of the gas industry—a gentleman known and esteemed throughout the gas world. He (the President) felt that he could not do less under the peculiar circumstances, before proceeding to their business, than propose the passing of a vote of condolence with Mr. Dougall on the bereavement he had sustained by the death of his wife and his father, and that it be placed on the minutes, and be communicated to Mr. Dougall by the Secretary.

Mr. BROCKWAY remarked that it was with melancholy feelings that he seconded the proposition which had been proposed by the President. He knew Mrs. Dougall to some extent, and every word that the President had uttered in respect of her had his fullest sympathy.

The proposition was passed by the members silently rising in their places.

MINUTES CONFIRMED.

The HON. SECRETARY (Mr. T. A. Guyatt, of Ely) read the minutes of the meeting held at Leighton Buzzard in April; and they were confirmed.

NEW MEMBERS.

On the proposition of Mr. H. WIMHURST (Sleaford), seconded by Mr. J. DAVIS (Gravesend), Mr. T. Shadbolt, of Biggleswade, and Mr. E. F. Keable, of Gorleston, were admitted members.

THE RETIRING PRESIDENT.

The PRESIDENT said they had arrived at a peculiar position in their programme. In the ordinary course of events, Mr. Dougall would have occupied the chair at that particular moment. Unfortunately, he was prevented from coming—not only through the great losses he had sustained, but he was in further trouble. He (the President) had that morning received a letter from him in

which he wrote that he was sorry he should not be able to be at the meeting. His children were under medical care; and his doctor was seeing them again that day. His duty therefore was at home just now. The members would from this understand Mr. Dougall's position, even more than from what had already passed. The least they could do was to propose the usual vote of thanks to their retiring President for his able and courteous conduct in the chair. Although possibly they could not express it in words, he felt sure the resolution would be passed with even more sincerity than usual.

Mr. G. R. Casterton (Melton Mowbray), seconded the motion, which was passed unanimously.

The President of the Institution of Gas Engineers.

The President announced that among the letters of regret for non-attendance was one from Mr. Charles Wood, the President of the Institution of Gas Engineers, who was unwell, and had been ordered by his doctor to keep to his bed.

AN EXTEMPORE INAUGURAL ADDRESS.

The President then delivered his address extemporaneously. He said—

Gentlemen,—Allow me, in the first instance, to offer you my sincerest thanks for having placed upon me the greatest honour that lies in your power to confer on any of your members—that of being President of your Association. I should like to say that I am deeply sensible of the honour, and also of the great responsibilities that the honour involves. I must ask you to pardon me if, at the outset, I strike a somewhat personal note; for I would have you to understand, gentlemen, that Presidents of Gas Associations can no more escape their own individuality and their own personality, than they can avoid any controversial subjects affecting the interests they represent.

Progress in the Utilization of Gas.

It is just about ten years since I came among you, when I took up my appointment at Grantham. In considering what I should say to you to-day, I have been actuated to a great extent by the results of that ten years of professional and technical intercourse; and I decided upon something which would take the form rather of a friendly chat than an attempt to deliver to you a set dissertation. Under these circumstances, you may permit me to be slightly retrospective. The ten years to which I allude have been the most momentous decade in the history of our industry. What a multitude of happenings we have witnessed during that period! There is the great triumph of the incandescent mantle; the rise and popularity of the prepayment meter; the extended use of gas for cooking and heating and for many other domestic and trade purposes; the development of the gas-engine; and many other things which one might easily mention may be regarded as the outstanding features of that period; while the methods of manufacture are likewise undergoing the same transitory process, and are subject to that critical scrutiny which is necessary, and which will never cease while improvement is possible.

Usefulness of Gas Associations.

There is one other feature to which I should like to allude, which is also an outstanding one with regard to the progress that has been made in our industry during the last ten years—that is, the part that has been played by the different Gas Associations of the country. May I at once say that the development and the progress that has been effected in the conduct of the work of our Associations has been as great in its way as the developments in respect of the manufacture and distribution of gas. District Associations occupy a peculiar position. They supply a want which cannot be supplied by the parent or central body. May I digress for a moment to congratulate our colleagues in Wales on having so successfully launched a District Institution such as, I think and hope, will be suited to their own particular requirements, and that will in time reflect credit and assist in the solution of the many problems which we, generally speaking, of the industry have to face. I trust they may have a useful career, that they may uphold the standard they have set themselves in the beginning, and that what they do will be an incentive to other Associations to look to their laurels lest little Wales puts them once more to the blush. When they take up a thing in Wales, once they set their hands to do a thing, they, as a rule, make it go. I am sure you will join with me in wishing the Welsh Institution every success and prosperity in the immediate and distant future. District Associations, as I have already said, occupy a peculiar position—such a position that it would be difficult for the central body to adequately fill. They have a sphere peculiarly their own; and it is interesting to cast back one's mind, and then note the present position. The scheme of affiliation has been effected, and it has progressed. The advantages that are likely to accrue are what have brought this into being. It is quite true that we, as District Associations, expect, and we think, that we shall benefit to some extent by this affiliation. I am sanguine, too, that the central body is likely to benefit even more if only they recognize one particular fact—that they have opened up through the District Associations channels of communication which are not likely to be invalidated or closed by the vagaries of the general ballot. While on this question I should like to exhort those of our numbers who are eligible for membership in the Institution of Gas Engineers, and who have not yet availed themselves of the opportunity (which, I understand, is still open) to become members on the special terms which were offered when the affiliation scheme was arranged without having to pay the usual entrance fee—not on account of the saving of the entrance fee (though that is a sufficient consideration for many of us), but that we, as an Association, may take our full share in the deliberations, that we may impress our views upon the Executive Council, and that we may be able to notify them of the trend and development of gas affairs in the particular district we for the time represent.

Before leaving this question, it has occurred to me to suggest that it would not be considered an ungracious action on the part of the Council of the Institution of Gas Engineers if they were to take such steps as would surround their President, when he takes the chair at the annual meetings (whether in London or elsewhere) with the Presidents of all the District Associations in the United Kingdom, whether affiliated or not with the Institution, and whether the particular individual representing any District Association happened to be during the year a member or not of the Institution. If we could see the President of the Institution during the opening proceedings, and during the reading of his Inaugural Address, supported in this manner, the gathering around him would be representative of the entire gas industry of the United Kingdom. Such circumstances, such a recognition, might bring about the affiliation of the District Associations that have not yet seen fit to affiliate.

How Has it Fared with the District and the Association?

Let us ask ourselves the question, How has it fared with us during the past ten years? I would refer you to some tabular statements I have prepared; and, in the first place, to Statement No. 1. The table shows that ten years ago, the total membership of this Association was 69; now it is 96—including the 13 associate members. The annual output of gas represented by the members of the Association was ten years ago 1740 million cubic feet; to-day, it is 10,042 million cubic feet. The capital involved was £1,475,290; now it is £6,538,456. In these figures I have omitted London and places that may be considered outside our district.

Statement I.

	Ten Years Ago.		Now.
Membership	69	..	96*
Annual output of gas	1,740,000,000	..	10,042,000,000†
Capital involved	£1,475,290	..	£6,538,456†

* Including 13 associate members.

† Omitting London and places outside the district.

Thus our growth of members has equalled 40 per cent.; the output of gas has increased by 5¾ times; and the capital employed by 4½ times.

We find our growth of members has equalled 40 per cent. The output of gas has increased 5¾ times; and the capital employed 4½ times. This, gentlemen, I take it, is no mean achievement. Speaking for the moment of the development of the Eastern Counties Gas Managers' Association, this comparison shows that we have not only increased in numbers, but that representatives of the large undertakings have joined our ranks, glad to participate in, and glad to contribute to, our technical intercourse. This, I think, is a healthy sign, and one which should induce and ensure greater progress in the future than in the past.

The question of the formation of Commercial Sections will be placed before you later in the day. I sincerely trust that the decision you arrive at will be such as to extend the usefulness of the Association, and benefit the industry, and likewise the public we serve.

Incandescent Lighting.

Ten years ago incandescent lighting was looked upon with grave suspicion in many quarters. To-day, we have so proved its worth that you cannot find a man who does not regard it as the great backbone of our lighting industry. It has given us the supremacy in all forms and powers of light. But does it not seem strange that, long as we have been acquainted with this form of light (we have it on the authority of no less than Professor Lewes), that the cause of the incandescence of the mantle still remains a mystery? But one thing we can say of it—namely, that the advent and development of the incandescent burner has made us practical gas men much better acquainted than ever before with the relationships of gas and air as combined in both luminous and non-luminous flames. We know very well now that we can obtain this or that or the other result by simply concentrating or bringing about rapid combustion on the one hand, or by extended combustion on the other. And if the incandescent burner has done nothing else for us, as gas men, than served to make us more practically acquainted with the laws that govern not only the complete combustion of gas, but which bring about certain results by extended or restricted or more rapid combustion as the case may be, then it has worked to our good. It is merely a truism to say that this development by means of the incandescent burner, with the great spread of the use of gas for cooking and heating, power, &c., has affected our industry down to its very foundations, and our entire operations are, as a consequence, undergoing the process of revision, throughout the practice of manufacture and supply.

Figures from Grantham.

To enable one to judge of the part played by the incandescent burner in any one particular place, I have caused an inspection to be made at Grantham of the burners in use by our consumers; and if you refer to Statement No. 2, you will see that we have 3336 consumers; we have 15,000 ordinary flat-flame burners in use, and we have 6000 incandescent burners in private use, and 406 public lamps so fitted. Reducing these figures to illuminating

Statement II.

Number of consumers	3,336
,, ordinary burners in use	15,000
,, incandescent burners in use (private)	6,000
,, public lamps (incandescent)	406

Illuminating Power.

Ordinary burners	15,000 × 15-candle power average =	225,000 c.p.
Incandescent burners	6,000 × 100 ,, ,, =	600,000 ,,
Lamps (public)	406, from 70 c.p. to 1000 c.p. =	50,000 ,,
	Total candle power in use =	875,000 c.p.
Illuminating power by luminous flames		225,000 ,,
,, ,, incandescent burners		650,000 ,,

or about one-fourth illuminating power by ordinary and three-fourths by incandescent burners.

Average per Consumer.

	Burners in Use.	Candle Power.
Ordinary burners (private)	15,000 ÷ 3336 = 4·49 =	67·35
Incandescent burners (private)	6,000 ÷ 3336 = 1·79 =	179·00
Per consumer	= 6·38 =	246·35

power, we find that the ordinary burners give us 225,000 candles, the incandescents 600,000 candles, and our public lamps 50,000 candles; making a total of 875,000-candle power actually used in gas lighting in Grantham. The illuminating power supplied by luminous flames being 225,000 candles, and by incandescent burners 650,000 candles, it follows that only about one-fourth is supplied by ordinary burners and three-fourths by incandescents, Running this out to per consumer we get 67·35-candle power by ordinary burners, and 179-candle power by incandescent burners. I think we may take Grantham as a fair average of the development of incandescent lighting in the different towns the members represent. The figures would appear to indicate that—as such a large proportion of the gas is used, when we come to include cooking, heating, and power, for non-luminous flames—the necessity for providing a luminous gas *per se* is very rapidly diminishing.

District Associations, as I have pointed out before, have a great part to play, and have played a great part, in solving the problems that are presented to us; but an Association such as ours, with 60 per cent. or so of the members representing undertakings of 50 millions and under per year, have not the facilities for research work which are enjoyed in some other localities. But the smaller undertakings have certainly this advantage, that they are able the more readily to put into practical, everyday use any scheme which arises and is likely to be of real service to the undertaking, and thus prove by the standard of practical utility whether this, that, or the other process is of any service or not, while the large undertakings must of necessity be guided more by the laboratory than by ordinary practice. We must, of course, ever turn to the laboratory for research or explanations of many causes; but everyday practice must of necessity be the final arbiter. Our District Associations have educated us in many ways, one of which is to individually watch more closely than we were previously accustomed to do, the work of others, and to apply to our own operations whatever appears to us to be of service. This way progress lies. We look to-day less to the solitary genius and what he produces, and more and more to united endeavour. One would venture to say that this Association has in the past contributed its quota to the questions affecting the industry; and I think I may further venture to say, it will continue to do so even more, and to greater advantage, than it has done hitherto. One might quote Shakespeare and say, "Let each man do his best," and whatever difficulty we have to meet will be readily surmounted.

How Best to Meet the Altered Requirements.

The problem facing us now is, undoubtedly, how best to meet the altered requirements placed upon us by our consumers. Each one has his own particular fad and his own particular panacea or idea as to what ought and what ought not to be done. We most of us have our own particular theory, even if we have not put it into practice; and as comparisons only can enable us to weigh our own and other contributions to the general weal, I have ventured to descend more from the general to the particular to-day than is usual in presidential utterances.

Nine years ago, I had the privilege of submitting to this Association a paper on the "Self-Enrichment of Coal Gas," * which was, so far as my knowledge goes, the first of its kind to be published before the Association. Some of those using water gas in this and other countries were not slow to take up the idea, and to introduce blue water gas into their foul mains instead of returning a stream of coal gas. They likewise found a certain amount of enrichment ensue from this particular process. We have developed in this direction, guided to a great extent by the indications of Professor Lewes, until we have arrived to what one may call the greatest development of this system, and which has been grandiloquently termed "auto-carburation," in the process in everyday work and use at the Cleethorpes Gas-Works. The swan-song to this auto-carburation, we have been told, Mr. Brown, of Nottingham, had the unique privilege of accompanying. But is it a swan-song? Such facts as we have had put before us by Mr. Brockway rather indicate lusty youth, and something more to come.

* See "Journal," Vol. LXVIII., p. 545.

Statement III.

Cleethorpes Working.

Blue water gas blended with coal gas	15 to 25 per cent.
Illuminating power of mixed gases	15½ ,, 16 c.p.

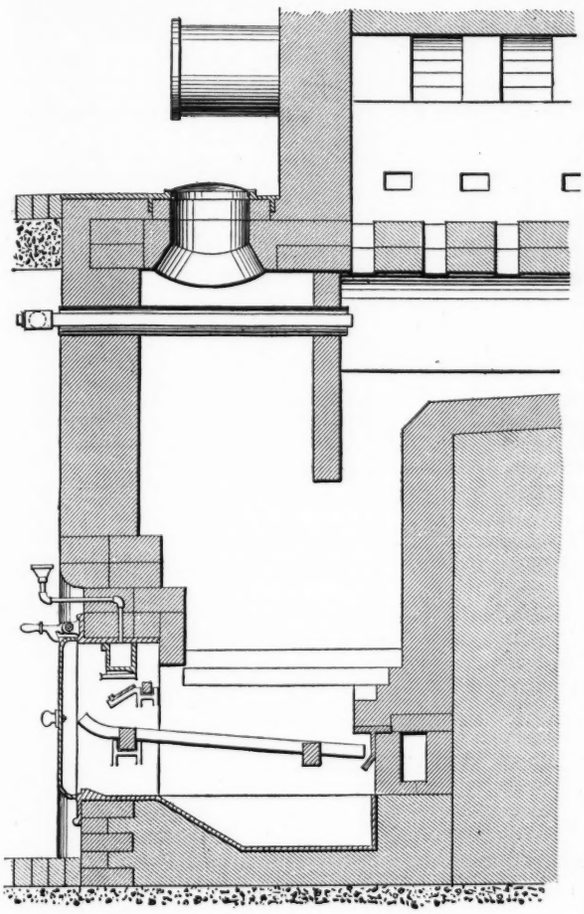
Proportions up to 15 per cent. are admitted in regular continuous flow into the foul main. *Result:* Diminution in illuminating power not more than ¼ candle. Beyond this, illuminating power falls. If more than 15 per cent. required, blue water gas is admitted into the coal-gas retorts while the first rush of gas is coming off—*i.e.*, intermittently. *Result:* Diminution in illuminating power not more than ½ candle up to 30 per cent. of blue water gas.

In Statement No. 3 you will find briefly set out the results of the Cleethorpes system of working. They are introducing here blue water gas, and blending it with coal gas to the extent of 15 to 25 per cent.; and the illuminating power of the mixed gas is 15½ to 16 candles. The proportions up to 15 per cent. are admitted in regular continuous flow into the foul main, and you notice that the difference in illuminating power is not more than a ¼ candle. If beyond 15 per cent. of the blue water gas is introduced into the foul main, the illuminating power will rapidly fall. If more than 15 per cent. is required, blue water gas is admitted into the coal-gas retorts while the first rush of gas is coming off; and the diminution of illuminating power is not more than ½ candle up to 30 per cent. of added blue water gas. One may naturally ask, What is this but self-enrichment, or auto-carburation? What is the maintaining of the illuminating power due to but the picking up of the other hydrocarbon vapours that were previously precipitated and carried away in the tar? If anyone doubts this, let him blend his gas in the holder instead, and the demonstration will be striking in its results.

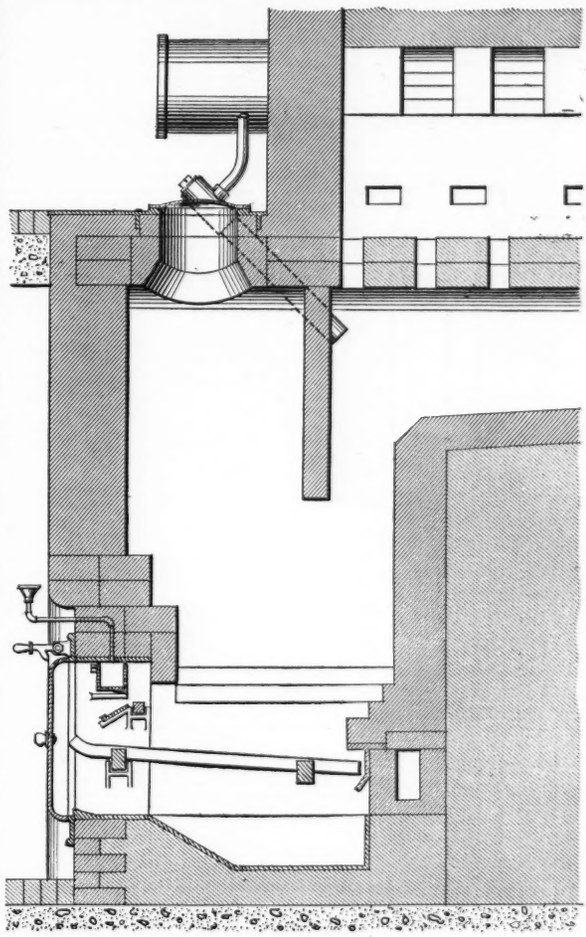
Experiences in the Mixing of Coal and Producer Gases at Grantham.

To revert to my own experience, I should like to refer to an incident—which occurred some five or six years ago at Grantham, and which was rather peculiar. The flush-cock from one of the hydraulic mains was inadvertently left open for a matter of thirty hours, with results which can be readily imagined. The gas fell in illuminating power to a great extent, but what extent I can scarcely say. The effect of the fall was very remarkable. The result upon the flat-flame burners was naturally a very thin flame with little illuminating power; while the result upon the incandescent burners was just the reverse. Where the one became almost obliterated, the other shone out more brilliantly than ever before. This naturally set one thinking; and then in my quiet moments—someone has suggested that I never have any quiet moments (laughter)—this incident would recur to mind, until eventually I thought "well there must be something in connection with the setting gases drawn in with regard to incandescent lighting." What, however, haunted me was the great load of inert nitrogen which would have to be carried on introducing gas in this way. But the tendency seemed to be to revert more and more to the anti-dip; and say what you will, when you are working without a seal, and your retorts are not in an ideal condition you must be drawing in setting gases in some proportion or other. But considering the tendency seemed to be in that direction, I thought it worth while to try, instead of drawing in setting gases wholly or partially consumed, the taking of the best producer gas possible, and introduce that into my foul main as I had introduced the returning coal gases in my self-enrichment process.

Eight or nine years ago, in designing a new retort-house, I put in Chester settings. You will recognize in one of the drawings the form of producer Mr. Chester designed, projecting beyond the front of the bench. On this producer [pointing to the drawing] I put a curtain wall, with the view of one end of the producer forming a hopper, so that this being filled, so long as there was coke in that portion of the producer, a constant thickness of fuel might be maintained on the furnace-bars. My surmise has proved correct; for we get as perfect a producer gas as it is possible to make. Having prepared my producer, I proceeded to my first set of experiments. First of all, naturally, one would wish to draw his producer gas from behind the curtain wall. I tried many kinds of pipes—fireclay, earthenware, wrought iron, and cast iron—with more or less success; but the kind I eventually used was 4-inch cast-iron pipe, with a 2-inch wrought-iron pipe contained in it, the annular space being packed with fireclay. This was the best arrangement we could make at that time. The distance, however, from the curtain wall entailed some amount of sagging; and the pipe would sag to such an extent that it would break or become perforated. The gas thus taken through the front wall of the bench was carried forward and up the gable wall of the retort-house, and into the blank flange of the foul main. This is a through bench, and we have two foul mains—one on each side, with separate outlets. The hydraulic main is shown by the sketch in the corner of the drawing. However, this suggested itself as the readiest way of introducing gas from the back part of the producer to the foul



First Arrangement of Producer Pipe in Producer.



Second Arrangement of Producer Pipe in Producer.

main, and so meeting the gases as they came along from the hydraulic main.

Having fitted up two beds of eight through retorts in this way, the first working tests extended over a period of four days. The conditions of work were one 2-inch producer pipe on two through beds of eight retorts each, working six-hour charges.

Working Tests (1).

Period.—Four days, May 12 to 16, 1903.

Conditions of Work.—One 2-inch producer pipe on two through beds of eight retorts each, working six-hour charges.

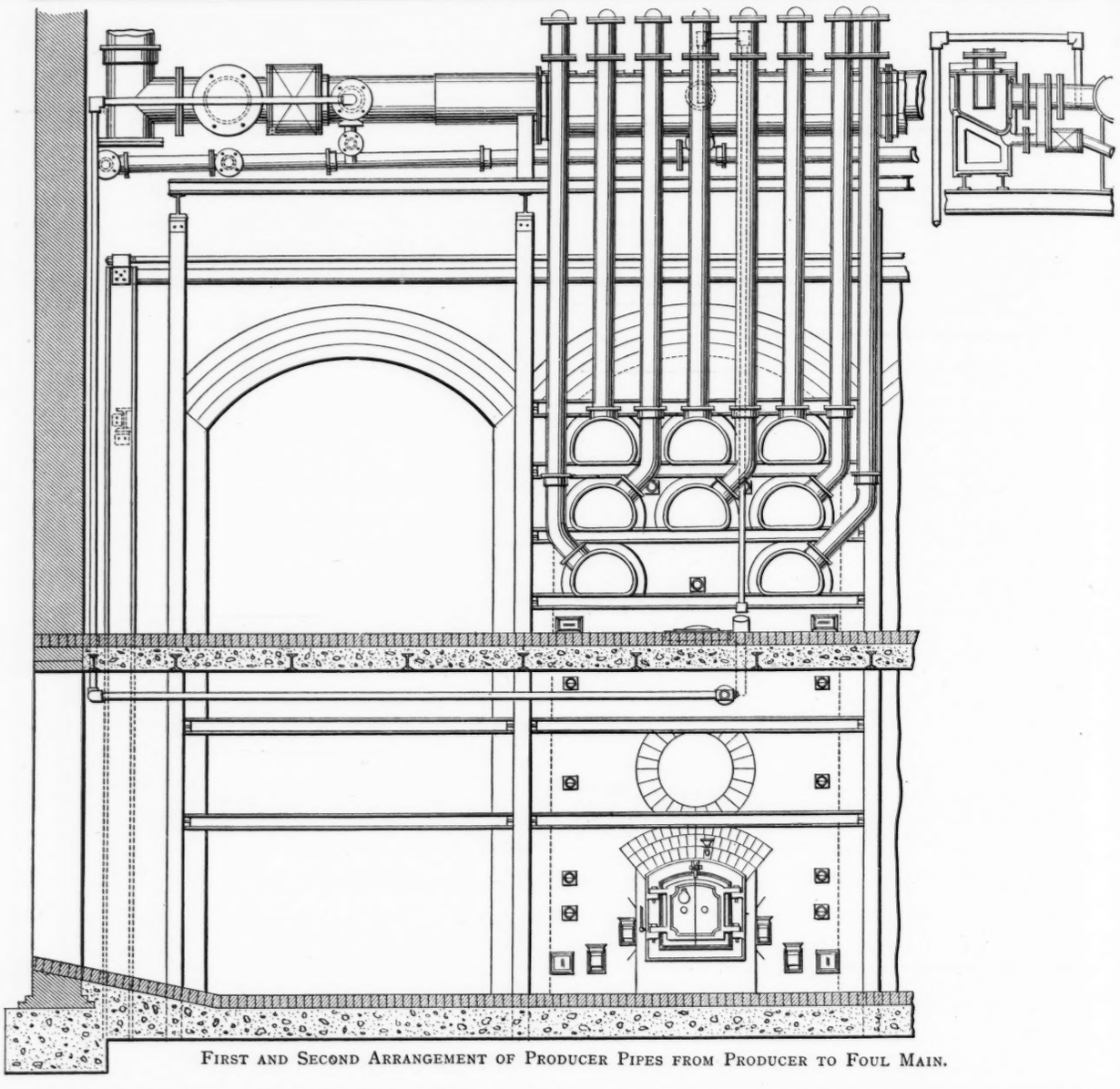
Coal used	78 tons.
Gas made.	883,000 cubic feet.
,, per ton of coal	11,320 ,,
Illuminating power	16·17 candles.

No calorific test. No enrichment.
Next six days' run, observations lost.

The coal used was 78 tons. The gas made per ton of coal was 11,320 cubic feet; and the illuminating power was 16·17 candles. There was no calorific test at that particular time, and no enrichment was used. The first set of tests disclosed the necessity for some kind of ready enrichment which could be more quickly adjusted than the self-enrichment then in use. We therefore proceeded to design some form of spirit enrichment. A 90 per cent. benzol was selected; and having two 25 feet square purifiers of Green's type, with four lids each, we placed under each lid a canvas screen. A stream of benzol was passed into each of the four lids, and allowed to drop on to the canvas screens. The benzol spreading over the surface of these, the gas licked it up and carried it forward; and so long as the summer season lasted, the enrichment was all that could be desired. It was readily adjusted as the gas rose and fell in quality; and the arrangement was quickly fitted. As, however, we got towards the winter season—some time in October—it was found that the enrichment was not so satisfactory. From that point we experimented with a steam-jacketed pipe until we had decided upon a home-made vaporizer and steam-jacketed pipe that would answer our purpose. The vapour was injected into the stream of gas running from the outlet of the station meter and returned by an old exhauster to a point a little farther on. Then we found we could do just as well with it by backing the gas in the opposite direction to that in which we had been drawing a portion of the gas. And so we continued, having adopted this vaporizer, until March of the present year.

At this stage the substance known as "Gazine" was brought to my notice. The material is, I think, a distillate of petroleum, and is primarily used for dissolving naphthalene in mains, services, and the like. Incidentally, the makers claim that it is an enricher, and its enriching power about double that of 90 per cent. benzol. I put it to the test; and the result of these tests you will see when you come to the working tests for the half year ended June, 1905. Our experience has been very peculiar with regard to this "Gazine." We had little or no trouble with naphthalene at any season of the year; and when we used "Gazine," or shortly afterwards, we discovered that it did not require so much "Gazine" to effect the necessary enrichment as to act as a naphthalene solvent. What little naphthalene we had in the holders, mains, or wherever it was located, was moved forward to the extremes of the district; and whereas we had no naphthalene before, we have had some this summer at the two extremes. By increasing the quantity, the whole trouble disappears. One thing about this substance that can be said is that it is a wonderful solvent of naphthalene when added to the gas in regulated quantities. In saying this, however, it must be remembered that we have had little naphthalene with which to deal; and as we have only been using the stuff since March, my experience has not been very long.

Reverting to the producer and to my experience with the different kinds of pipes across the hopper space, as the winter approached and we changed to other beds, we availed ourselves of the experience gained by the arrangement already explained, and we took a shorter cut to the point where we desired to introduce the producer gas. Instead of taking the former direction, the producer tube was fixed diagonally so as to project through the charging-floor at the top and the curtain wall at the bottom end. Moreover, having had trouble with pipe sagging and burning, we placed the producer pipe—if I may so term it—in this altered position, so that it was practically embedded (almost entirely so) in the fire-brick work from one end to the other, projecting into the back part of the curtain wall to the producer. We had tried various kinds of pipes originally; and on this occasion a wrought-iron pipe was used. Although this lasted a considerably longer time in this position than in the horizontal, it did not last so long as we should have liked. We commenced experimenting again with fire-clay tubes; and the final results of our experiments was the evolving of a fire-clay tube of the shape shown in Drawing B, with a cast-iron cap. This has a hole in the side from which a branch is taken. After substituting the fire-clay pipe for the wrought-iron producer pipe, it was found that the gas entering the branch to the hydraulic main was hotter than before, and that condensation and deposition in the pipe with which there had been trouble hitherto was much reduced. Still there was a little deposit in the form of sooty dust. But eventually I



First and Second Arrangement of Producer Pipes from Producer to Foul Main.

may say (without taking you through the whole set of the experiments) that we got over this difficulty by coupling up steam-pipes. Once a day the connection was shut off by cocks which were inserted in the branch, and the steam was turned on. In this way, by blowing the pipes out once a day, the whole of the deposit was got rid of; and instead of having to take out the pipes for cleaning once every two or three weeks, once every two or three months was sufficient.

I was also astonished to find—contrary to what I had been led by my self-enriching experiments to expect—that the higher the temperature at which I could introduce the producer gas into the foul main, the better the results. In the whole of my experiments with self-enrichment, the increase of the temperature did not increase the ability of the gas to pick up hydrocarbons, or whatever it did pick up; and the gas that went in cold gave as excellent results as when the gas went in hot. However, here we reached higher temperatures than we had done before. This led me to go a step further, and coat the vertical pipe with various insulating materials; and eventually we coated it with asbestos packing. The only difficulty we had was at the lower end of the pipe, which was subject to the wear and tear of everyday work. You can readily understand that, with the constant collision with barrows, shovels, and the like, we had the greatest difficulty in keeping on the insulating material. When the pipe remained uncovered, the results fell; and when we kept the pipes well insulated there, we got the best results. We hit upon the device of a light sheet-iron casing, considerably larger than the wrought-iron pipe, which left an annular space between the casing and the pipe; and this was packed with fire-clay. The fire-clay quickly burnt hard; and we found it a very good insulating material, and it stands well the rough wear and tear of every-day work. The effect of the insulating of the pipes, over and above what they were doing before, was that the temperature at the condensers is now fully 20° Fahr. higher than it used to be with the same make of gas; and there is no doubt this is having a very beneficial effect.

Regarding the passage of the gas from the producer to the foul main, we had not proceeded very far with the experiments before we were made fully alive to the fact that our method of producer gas drawing was wrong, and was giving erratic results. The first diagram [p. 819] gives an illustration of what we conceived was a $\frac{1}{2}$-inch constant pull. Thinking we were working with a steady $\frac{1}{2}$-inch pull, we were surprised at what was actually being done. If you note the curves of the lines (we work six-hour charges—quarter-past twelve, three, six, nine, and twelve, and so on) you will observe that, as the charge is falling off, down to (say) six o'clock, the pull is increasing; so that we were really drawing in a greater proportion of the producer gas when we were making the smallest quantity of coal gas, and *vice versâ*. The next diagram gives an illustration of the endeavours to regulate this by hand, and by watching the ordinary water-gauge. We thought that we were doing this most successfully; but that is the actual diagram. After some long consideration, I eventually devised another arrangement (see Drawings D and E). We have an exhauster steam-governor, and a portable vessel open at the top and made with a slit in it, so as to be able to place it on the centre of the bell. The little can (if I may so term it) shown in the illustration stands on the top; and if we wish to increase the pull after the first retort is charged, we place the can on the shelf at a lower level—the result being that the water is gradually run off; and the process is reversed before charging time comes round again. The result of this is shown in the diagram, which indicates that this arrangement is a success. The remaining three diagrams illustrate the operations at different times of the year, showing that the results were practically the same with varying makes. One is a Midsummer diagram, the second is a Midwinter one, and the other is again a Midsummer one. You will note that in the Midwinter one the range of pull variations is rather greater than in the summer season.

I must now refer you, gentlemen (I hope I am not trespassing too much on your patience), to the working tests. Statement

Working Tests (2).

Period.—Four days, May 22 to 26, 1903.
Conditions.—One 2-inch producer pipe on, 1½-inch seal and 1½-inch pull; two through beds of 8 retorts each, nine-hour charges.

Coal used	57 tons 19 cwt.
Benzol used	16 gallons.
Gas made	628,000 cubic feet.
,, per ton of coal	10,841 ,,
Benzol used per 1000 cubic feet	0·0254 gallon.
Illuminating power	16·68 candles.
Calorific ,,	541 B.T.U. net.

Note.—Aiming at 17-candle power gas.

Working Tests (3).

Period.—Eleven days, May 26 to June 6, 1903.
Conditions.—Two 2-inch producer pipes on, 1½-inch seal and 1-inch to 1½-inch pull; two through beds of 8 retorts each, nine-hour charges.

Coal used	156 tons 17 cwt.
Benzol	116½ gallons.
Gas made	1,915,000 cubic feet.
,, per ton of coal	12,209 ,,
Benzol used per 1000 cubic feet	0·0608 gallon.
Illuminating power	17·03 candles.
Calorific ,,	514 B.T.U. net.

Note.—Aim, to increase quantity and retain 17-candle power gas.

Working Tests (4).

Period.—23 days, June 6 to 29, 1903.
Conditions.—Two 2-inch producer pipes on, 1½-inch seal and 1½-inch pull; two through beds of 8 retorts each, nine-hour charges first 13 days, and six-hour charges last 10 days.

Coal used	329 tons 17 cwt.
Benzol used	177 gallons.
Gas made	3,904,000 cubic feet.
,, per ton of coal	11,835 ,,
Benzol used per 1000 cubic feet	0·0453 gallon.
Illuminating power	16·46 candles.
Calorific ,,	510 B.T.U. net.

Note.—Watching effect of gradually reducing illuminating power, but trying to retain quantity.

Working Tests (5).

Period.—31 days, June 29 to July 30, 1903.
Conditions.—Two 2-inch producer pipes on, 1½-inch seal and 1-inch to 1½-inch pull; two through beds of 8 retorts each—*i.e.*, 32 retorts—six-hour charges for 7 days, and 24 retorts charged with six-hour charges for 24 days.

Coal used	446 tons.
Benzol	334½ gallons.
Gas made	5,523,000 cubic feet.
,, per ton of coal	12,383 ,,
Benzol used per 1000 cubic feet	0·0605 gallon.
Illuminating power	15·90 candles.
Calorific ,,	520 B.T.U. net.

Note.—Aiming at 16-candle power and increased quantity.

Working Tests (6).

Period.—38 days, July 30 to Sept. 6, 1903.
Conditions.—Two 2-inch producer pipes on, with steam coupled for blowing out deposit daily. Seal 1 inch, pull ½ to ¾ inch; two through beds of 8 retorts each, six-hour charges.

Coal used	655 tons 9 cwt.
Benzol used	314 gallons.
Gas made	7,477,000 cubic feet.
,, per ton of coal	11,407 ,,
Benzol used per 1000 cubic feet	0·042 gallon.
Illuminating power	17·15 candles.
Calorific ,,	544 B.T.U. net.

Note.—Capacity of producer pipes and reduced pull restricted quantity.

SPECIAL NOTE.—Transferred carbonizing operations to other beds on Sept. 17, 1903. Provided each bed with one 1½-inch producer pipe from its own producer, each being fitted with steam supply for clearing out deposit. Next two working tests stated quarterly.

No. 1, I have already referred to. In No. 2, the test extended over a period of four days. The gas made was 10,841 cubic feet per ton of coal; the illuminating power was 16·68 candles, and the calorific power 541 B.T.U. We were then aiming at maintaining a 17-candle power gas, with the view of seeing the quantity we could obtain. Up to this stage, the system had only been applied on one side of the bench; but with two 2-inch producer pipes (as shown in Working Test No. 3) we obtained 12,209 cubic feet of gas, having increased the quality to 17·03 candles—the benzol consumption being 0·0608 gallon. The calorific power is 514 B.T.U. net. The aim was to increase the quantity of gas, and yet to maintain a 17-candle test. In the fourth test, the make of gas was 11,835 cubic feet per ton, the illuminating power 16·46 candles, and the calorific power 510 B.T.U. net. We were at this time watching the effect of gradually reducing the illuminating power, but at the same time trying to retain quantity. You will notice that the benzol decreased. In the next test, the gas made per ton was 12,383 cubic feet; the illuminating power was 15·90 candles; and the calorific power 520 B.T.U. net. The aim here was 16-candle power and increased quantity. The succeeding test was for 38 days. The make per ton was 11,407 cubic feet; the illuminating power 17·15 candles, and the calorific power 544 B.T.U. Here we have increased our proportion of coal gas, and not increased the proportion of producer gas, so we had a low benzol consumption and low quantity.

First Quarterly Test.

Period.—Quarter ending Sept. 30, 1903.
Conditions.—Various.

Coal used	1,530 tons 2 cwt.
Benzol used	945 gallons.
Gas made	18,197,000 cubic feet.
,, per ton of coal	11,892 ,,
Benzol used per 1000 cubic feet	0·0519 gallon.
Illuminating power	16·73 candles.
Calorific ,,	512 B.T.U. net.

Second Quarterly Test.

Period.—Quarter ending Dec. 31, 1903.
Conditions.—Various; ¾-inch seal and ½-inch pull until Oct. 24, when water loading of exhauster governor commenced.

Coal used	2,465 tons 4 cwt.
Benzol used	1,940 gallons.
Gas made	28,703,000 cubic feet.
,, per ton of coal	11,643 ,,
Benzol used per 1000 cubic feet	0·0675 gallon.
Illuminating power	16·97 candles.
Calorific ,,	512 B.T.U. net.

Note.—About Oct. 12 put benzol vaporizer to work.

SPECIAL NOTE.—Working tests now expressed half-yearly.

Half Year ending June 30, 1904.

Coal used	3,699 tons.
Benzol	3,001 gallons.
Gas made	43,821,000 cubic feet.
,, per ton of coal	11,846 ,,
Benzol used per 1000 cubic feet	0·0684 gallon.
Illuminating power	16·25 candles.
Calorific ,,	513 B.T.U. net.

Note.—About the end of this half year, fire-clay tubes were adopted in the producers instead of cast-iron and wrought-iron with fire-clay packing between.

Half Year ending Dec. 31, 1904.

Coal used	3,863 tons.
Benzol used	2,962 gallons.
Gas made	46,994,000 cubic feet.
,, per ton of coal	12,165 ,,
Benzol used per 1000 cubic feet	0·0630 gallon.
Illuminating power	15·56 candles.
Calorific ,,	510 B.T.U. net.

Half Year ending June 30, 1905.

Coal used	3,610 tons.
Benzol used	754 gallons.
Gasine ,,	272 ,,
Gas made	43,254,000 cubic feet.
,, per ton of coal	11,981 ,,
Benzol used per 1000 cubic feet on 23,804,000 cubic feet	0·0316 gallon.
Gasine used per 1000 cubic feet on 19,450,000 cubic feet	0·0139 ,,
Illuminating power	16·16 candles.
Calorific ,,	513 B.T.U. net.

Note.—Introduced pipe-covering during this half year, to keep gas at higher temperature at the point of entry into the hydraulic main outlet.

The carbonizing was transferred to other beds in September; and then each bed was provided with No. 2 arrangement. This was decided upon as requisite to conveying the necessary proportion of producer gas, and as not likely to involve us in trouble through introducing too much producer gas. The results are stated in quarterly tests. The first shows 11,892 cubic feet per ton of coal; the illuminating power 16·73 candles; the calorific power 512 B.T.U. net. The second quarterly test is slightly lower in gas, slightly higher in illuminating power, and the same in calorific power. During that quarter (about Oct. 12) the steam-jacketed benzol vaporizer was put to work. From this point the tests are expressed half-yearly. In the half year ending June, 1904, the gas made per ton was 11,846 cubic feet, the illuminating power 16·25 candles, and the calorific power 513 B.T.U. net. The benzol used was 0·0684 gallon per 1000 cubic feet. About this time fire-clay tubes were adopted, instead of cast iron and wrought iron with fire-clay packing. In the following half year, the gas made per ton was 12,165 cubic feet, the illuminating power 15·56 candles, and the calorific power 510 B.T.U. net. There we were working a lower illuminating power, with about the same benzol consumption as formerly, and with a slight decrease of the calorific power. However, in the half year to June last, the gas made was 11,981 cubic feet; the illuminating power was 16·16 candles, and the calorific power 513 B.T.U. net. The benzol used on a certain proportion of the gas was 0·0316 gallon per 1000 cubic feet. Here we were beginning to insulate the pipes, with the result that less enrichment was required; and if you compare with the previous half year, you will find we are again down with the benzol consumption. In this half year, too, we introduced the use of "Gazine," the consumption being 0·0139 gallon per 1000 cubic feet.

For simplicity's sake, so that you may readily compare half-yearly averages of illuminating power and calorific tests, I have compressed into the next table in all some 677 tests:—

HALF-YEARLY AVERAGES OF ILLUMINATING POWER AND CALORIFIC POWER TESTS, COMPRISING IN ALL 677 SETS OF TESTS.

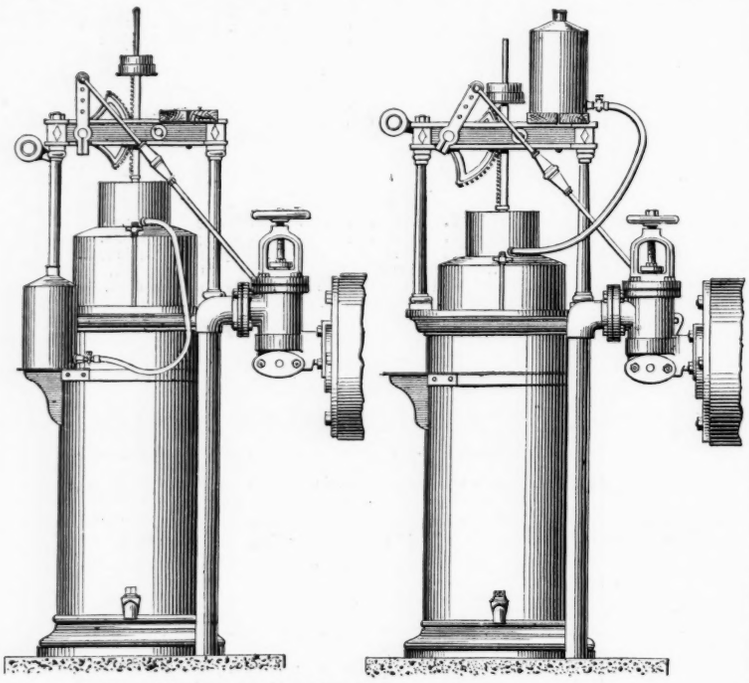
	Candles.	B.T.U. Net.
Dec. half of 1903.—Illuminating power, 16·75; calorific power,		516
June ,, 1904 ,, ,,	16·25 ,, ,,	513
Dec. ,, ,, ,, ,,	15·56 ,, ,,	510
June ,, 1905 ,, ,,	16·13 ,, ,,	515

ANNUAL YIELDS PER TON OF COAL.

	Gas. Cubic Feet.	Coke. Cwt.	Tar. Gallons.	Liquor 5°. Gallons.
Average of five years ending Dec. 31, 1902	10,200	9·00*	11·00	25·00
Average of five years ending Dec. 31, 1903	11,308	8·66*	11·93	28·56
Average of five years ending Dec. 31, 1904	12,009	8·74*	9·17	33·66

* Forked and screened coke only. Most of the reduction due to increased proportion of coke broken and screened before sale. Proportion of decrease in coke due to process = $\frac{1}{10}$ cwt. per 1000 cubic feet of added gas.

Further, with regard to the annual yields, I have taken the average of five years preceding the commencement of these tests



THE WATER LOADING ARRANGEMENT OF THE GOVERNOR.

—viz., in December, 1902. Referring to the yield of gas going up as the proportion of coke went down, most of the reduction in coke was due to the increased proportion broken and screened before sale. The proportion of decrease due to the process was equal to $\frac{1}{10}$th cwt. per 1000 cubic feet of added gas.

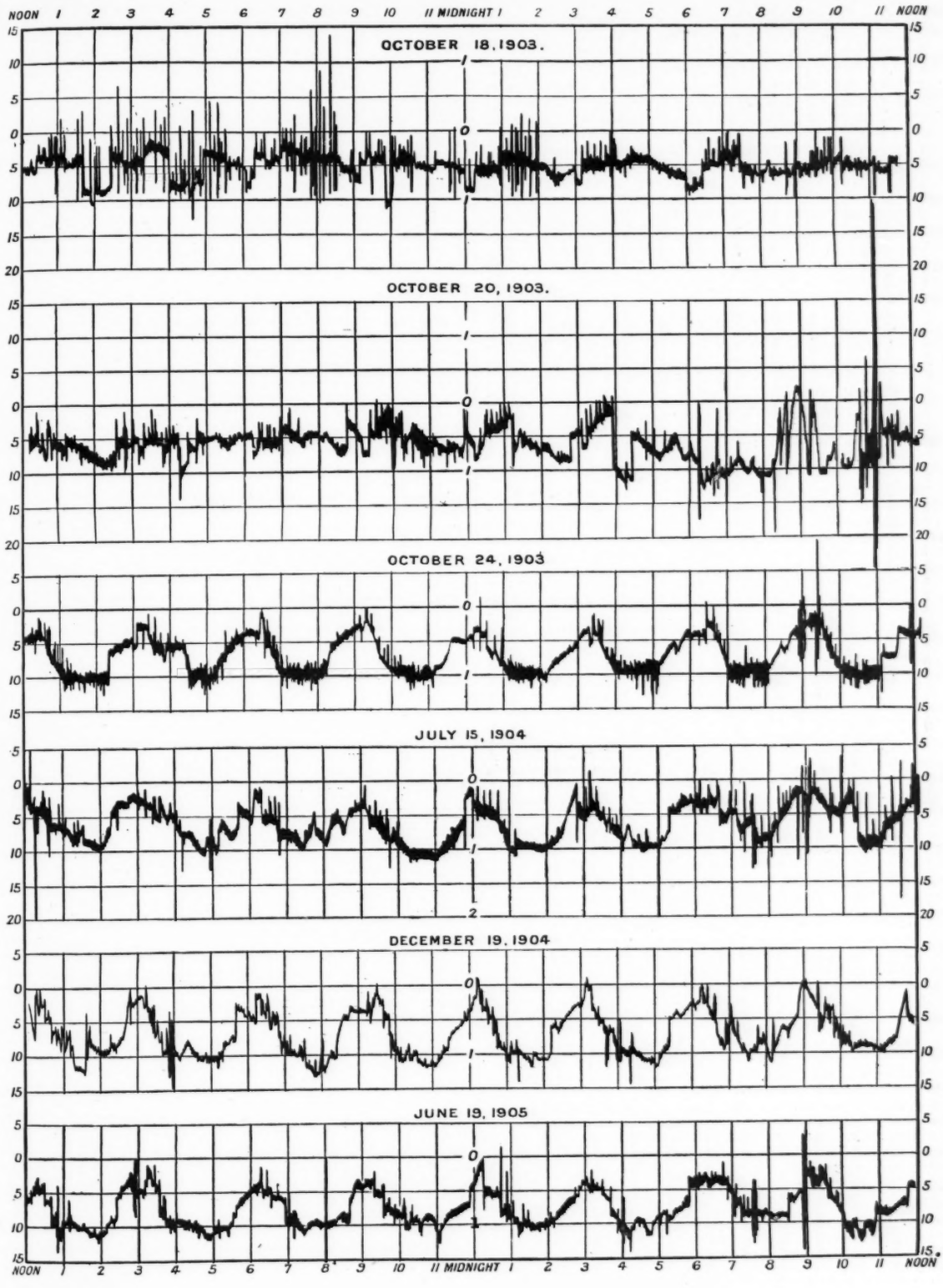
I should here explain our method of testing the illuminating power of gas. When making coal gas alone, it is our custom to test with the standard "London" argand burner, at the rate of 5 cubic feet, against the Methven screen; and when we speak of 17-candle gas, we mean gas tested in that way. We use the same method with the blend of gas; but it is found that not quite so much air is required for the combustion of the mixed gas. To meet this we placed two hard-wood wedges immediately under the centre of the burner, with a small cone placed on the top one. The wedges slide one on the other, and raise or lower the cone as the case may be, and thus adjust the air to the inner side of the flame to what is required to give the maximum light when burning at the rate of 5 cubic feet an hour. This is the method we have adopted right through; so that, when I speak of 16-candle gas, I mean 16-candle gas tested in this particular manner against the Methven screen. As a matter of curiosity, and to satisfy myself as to how it would come out, we made arrangements for testing against a 10-candle pentane lamp when burning at about the 5 cubic feet; and with the air supply to both the inside and the outside of the flame regulated, the test gave 16½ candles. I think it only right to give you these particulars, so that you may appraise their value from your own particular standard.

It will be readily seen that I have approached this subject from the purely practical and utilitarian point of view. These experiments have confirmed the notion that, to use an Americanism, "we have given our customers more than they can chew." I think it is a mistake to take purely laboratory results, especially over short periods, and estimate the value of any change in any gas by the application of rule-of-three. It might be right for the laboratory; but what is right in every-day practice is very often a very different thing. The practical utility or otherwise is the criterion of true value. Our friends of the electrical industry have highly favoured us, since they invaded our domains, by providing us with a standard of comparison in lighting and lighting effects which we never had at our disposal before. In this particular instance, it so happens that I was prepared for my first set of experiments about the time that the Grantham electrica undertaking was arranging to send out current, and so we have been able to compare the two side-by-side in practical everyday use. I turned on the blend of gas on the same day as the supply of the electrical current was started; and we have been working the blend of gas in face of the electrical competition for two-and-one-third years. I can safely and truthfully say this particular blend of gas is much more effective as judged by the standard, not of the laboratory test, but of practical commercial utility, in the face of forced competition. One is prone to over-estimate rather than under-estimate the value of his own efforts; but it is well within truth to say that this blend of gas has demonstrated its superiority over the old for every purpose to which gas is put, save for luminous flames; and on account of these, 16-candle power (tested as I have explained to you) and 500 British thermal units net, are our present working standard. This is the conclusion at which we have arrived from our own particular experiments with these gases. The gases are better suited to general conditions than a heavier standard candle gas. You will notice that in the half year to June, 1904, we averaged 15·56 candles; but in the past half year we restored the illuminating power to 16·16 candles. This was due not to the incandescent burners, not to cooking, heating, or power, but to the number of flat-flame burners still in use. It was found when we got below 16 candles, the old union jets were slightly affected, and so we determined upon the 16-candle power test, in conjunction with a calorific power of 500 B.T.U. net, as our working standard.

With regard to the use of this gas in incandescent burners, it has been of great value to us. We have a large number of consumers on the maintenance system; and we find that now the sooty mantle is the exception, whereas it used to be almost the rule. In regard to high-power lighting—say, 500 to 1000 candles—it appears to my mind that the incandescent burner, particularly the self-intensifying burner, is very much like the high-power gas-engines. Too heavy a gas is more detrimental to them than gas of lower nominal value. Respecting gas-fires, we have had some remarkable experience. Fires that formerly required clearing once every year now run for a couple of years without clearing. The fuel never has black patches about it, such as it previously had. In my office at the works, I have a fire that was coated with soot, and it has burned itself quite clean. As to cookers, whereas we used to have numerous complaints as to the deposit of soot on kettles, pans, and so on, these have now disappeared. So that you see we have removed the surplus of carbon which really did more harm than good. As to gas-engines, the expense has been in line with that already stated. There is one instance that came under my notice only last week. A gas-engine that for one-and-three-quarter years has been running most working days, had its cylinder opened for the purpose of tightening the piston-rod; and the coating of carbon was little more than a skin. In another case, where the engine is opened quarterly, over the last two years there has been no deposit at all. In another case where the cylinder is opened half-yearly, nothing is found but a skin and a little dust. Another engine, which happened to be put to work just at the time we commenced sending out this blend of gas, was opened eighteen months afterwards, and no deposit was discovered. It has not been opened since.

These facts demonstrate that the gas is absolutely consumed, and nothing is left over to deposit and cause trouble in that way. The reason is patent. The ordinary bunsen burner is unable to thoroughly and completely deal with too heavy a food. In regard to the bunsen burner, the gas, we may take it, is fairly constant, but the air varies. We know very well that the inflow of the air is very easily and rapidly checked by means of the corrosion of the burner-head and slight deposits; and when we bear in mind that it is the last increment of air which gives us the greatest illuminating effect in the incandescent burner, one can see how surely it may occur that the perfect burner of to-day is the imperfect burner of to-morrow, provided the gas is too heavy for the burner, under every-day working conditions, to draw in a sufficient quantity of air. With regard to the inverted incandescent burner, we have had a peculiar experience. If the gas rises (tested in the way explained to you) beyond 16¼ candles we have trouble with inverted burners, and when it is down to 16 candles there is no trouble at all.

As to the calorific value, some of my friends will doubtless endeavour to appraise the blend by applying to the laboratory value the rule-of-three sum to which I have already referred. In the laboratory, that would be the correct way of appraising its value; but it is not so in practice, under every-day conditions. The luminous-tipped boiling-burner flame, the luminous tip to the gas-fire flame—these are all waste, and indicate that a deposit of carbon is taking place. Our blackened ceilings may be due to the dust in the atmosphere; but no doubt some of it is owing to the carbon also. If that last increment of air be withdrawn, what is the result in your incandescent gas-burner? Not incomplete combustion so much as combustion not so accelerated as it ought to be. A few particles of carbon are thrown off; and now, when the



inspector goes round, he possibly finds a bit of soot on the tip. Remove that increment of carbon and restore the increment of air lost, and you will then know what the flame ought to be.

The effect of the incident I originally referred to was the immediate cause of these experiments. I can say the results of these experiments have, in a large measure, been to meet the case of the present; and at the same time we have found out more than I anticipated. The experiments, in the first instance, were undertaken from the point of view of curiosity; and though I have not run it out into figures, the financial aspect is also good.

I submit these, the results of my feeble efforts, to you, gentlemen, as my personal contribution to the great question that is facing the industry to-day. Please understand that I make no claim to finality or to anything meritorious. I simply relate to you why I did certain things, and the results of so doing. As such I place them at your disposal. With all reverence, I say: "Such as I have, give I unto you." It is my intention to invite you to visit Grantham next April; and if you are sufficiently kind as to favour me with a visit during my year of presidency, any further developments that may take place you may depend upon it will be freely at your disposal. I shall be most happy to demonstrate to this Association the practical commercial prosperity of this blend of gas, on which you have been so good as to patiently listen to me.

Loud applause was the first compliment paid the President for his eloquent and instructive address.

Mr. J. Carter (Lincoln) said they ought not to allow another single feature of their business arrangements to proceed until the

members placed on record their appreciation of the address to which they had listened. A very cursory examination of the figures put into their hands must convince them that the President had spared no time or trouble in preparing the matter for the address with which he had favoured them. He (Mr. Carter) proposed that they enter on the minutes a record of their appreciation of this suggestive deliverance.

Mr. C. F. Ruggles (Leighton Buzzard) seconded the motion, which was unanimously carried.

The President said he hardly knew how to thank the members for their vote. It had been of great interest to him to prepare the address, but not so much as the conducting of the experiments. Although some little time had been spent on the matter, and some little thought had been given to it, still one could only regret that much fuller information was not at the members' disposal. He thanked the members most heartily—first for expressing their appreciation in the manner they had done; and, secondly, for the very attentive hearing they had given him.

The Question of Commercial Sections.

The President said, with regard to the question of Commercial Sections which he had the honour of placing before the members at their last meeting, he trusted the members had all received the report of the Committee on the subject. He suggested that the report be taken as read.

This was agreed to.

The report was as follows:—

THE FORMATION OF COMMERCIAL SECTIONS.

In accordance with the instructions given at the general meeting held in April, the Committee have given this matter careful consideration; and in view of the success achieved by another District Association, and also by a number of members in the northern portion of this Association's district, they are of opinion that the members would derive considerable advantage therefrom.

As a commencement, the Committee think it better to make a few suggestions, and to discuss the matter at the forthcoming general meeting, and allow the matter to be developed as necessity or further experience indicates. They therefore make the following proposals, which will be open for discussion at the general meeting:—

(1) That the district covered by the Association be divided into two sections—East and West—the dividing line being the Great Eastern main line from London to Lynn.
(2) That the centres for meetings be Cambridge and Grantham.
(3) That each Sub-District be controlled by its own Committee, consisting of Chairman, Secretary, and three members, subject to the general supervision of the Eastern Counties Association Committee, and that each section draft its own rules as to number of meetings, &c.
(4) That the subscription be 7s. 6d. per annum to cover working expenses.

The following model rules have been found to work well in another district, and are therefore given as a guide.

Suggested Model Working Rules.

Coke Returns:

Each subscribing member must return to the Secretary, not later than Monday in each week, one of the postcards supplied for that purpose. This must contain information as to the stock of coke on the preceding Saturday; the yard price charged; the quantity of surplus for disposal, if any; current price for contracts free on rails; and also the price charged for running contracts, if any.

These particulars are to be tabulated by the Secretary and a copy supplied to each subscribing member.

The information supplied from time to time must be treated in strict confidence by the members receiving the returns.

No attempt will be made to fix prices; but the information will be intended to guide the subscribing members.

If any subscribing member should fail to send in the return two weeks consecutively, the tabulated return would not be supplied.

Monthly meetings will be held; and, as far as possible, these will be at Cambridge or Grantham as the case may be. Notices will be served upon each member giving place, date, and the time of each monthly meeting.

When discounts are given on coke to large consumers, these special discounts must be stated in the first return to the Secretary.

Any member of the Section will be entitled to bring forward for discussion any matter of commercial interest, or upon commercial information.

Mr. J. Davis (Gravesend) moved—"As it is desirable, in the interests of the gas industry, that the Eastern Counties Gas Managers' Association should extend its operations so as to include so much of the commercial side of local gas affairs as may come within its province, the Committee be and is hereby instructed to take such action as may be necessary for dividing the district into suitable sub-districts; each sub-district having its own Committee, the Chairman of which shall of necessity be a member of the Association, and report annually to the Committee of the Association who shall at all times exercise discretionary powers and a controlling influence over the Sub-District Committees; the decision of the Association General Committee shall in all cases be accepted by the Sub-District Committees as binding."

Mr. G. R. Casterton (Melton Mowbray) seconded the motion.

The President said the adoption of the report having been moved and seconded, it was only due to the members that he should read a letter that he had received from Mr. Auchterlonie, of Cambridge. The letter was as follows:—

Cambridge University and Town Gaslight Company,
Sept. 20, 1905.

Dear Mr. President,

I very much regret that I will be unable to travel to Cleethorpes to attend the meeting of the Eastern Counties Gas Managers' Association.

I have carefully read the suggestions of the Committee on the question of the formation of Commercial Sections.

The resolution to be proposed has my support; and, on the whole, I agree with the recommendations of the Committee. If, however, the members are to be furnished with information as to stocks and prices in their own Section only, then I do not consider that the information would be of much utility to gas managers lying near the line of demarcation in the Eastern Section. I do not suffer from the competition of my Eastern neighbours; but my price is governed by competition from North and North-West of Cambridge. Therefore, I naturally would like information as to stocks and prices of the Western Section of our Association; and I expect that others scheduled in the Eastern Section will agree with me.

Then again, while I agree that it would be a wrong policy to attempt to fix prices, I think that there ought to be an honourable understanding that the information furnished would not be utilized for "cutting-in" for contracts in each other's districts.

I am authorized by my Board to offer the use of our Board-room for the purpose of holding the meetings of the Eastern Section; and it will give me much pleasure to join and give the new departure any support that I can, for I think there is a possibility of much benefit being derived from informal discussions on commercial questions.

I remain, &c.,
Jas. W. Auchterlonie.

Proceeding, the President said in the report it was suggested that the two Sections should have their respective headquarters at Cambridge and Grantham. This suggestion the Committee made purely from geographical considerations; and, equally with Mr. Auchterlonie, they would be pleased at Grantham, to the best of their ability, to accommodate the Western Section, if it made Grantham its headquarters. Possibly, some members might like to supplement Mr. Auchterlonie's remarks. Of course they all understood that the information placed at disposal should not be used for cutting prices. That was the principle on which the Sections were to be founded.

Mr. J. H. Troughton (Newmarket) remarked that he should like to ask the Committee, through the President, whether the idea of the two Sections which it was proposed to form—viz., the East and the West—covered the distribution of information by the West to the East, and likewise by the East to the West. Mr. Auchterlonie, very rightly, made a point of this. Again in regard to the division of the two Sections, it was suggested that it should be the main line from London to Lynn. He (Mr. Troughton) thought they would have to curtail that a little, and say from Cambridge to Lynn, because members south of Cambridge to get to Grantham would have to go through Cambridge. He certainly thought the Commercial Sections should be formed; and, so far as he was concerned, if any meetings were held in his district, he should be pleased to place his Company's Board-room at the disposal of either Section at any time.

The President said, with respect to Mr. Auchterlonie's remarks as to the exchange of information, experience gained in the Manchester district was a sufficient answer to any question that had been raised. There would be nothing to prevent intercourse. Concerning the line of demarcation, they must start somewhere. The Manchester district was the only object-lesson they had. The district was originally divided into four sub-districts. They did all they could to so divide members, in the best interests of the industry, into their respective sub-districts; but, in spite of all care and all foresight, the four had resolved themselves into two. In the case of the Eastern Counties, it would be seen that, if the resolution was passed, it instructed the Committee to take such action as was necessary with regard to the division. The line was only a suggestion. At the first meeting of the Committee, they would instruct the Secretary to send out a circular to inquire of each individual member of the Association with which sub-district he would prefer to be associated. The line from London to Lynn was only an imaginary one; so that there would be no difficulty in anyone being in any Section he liked, according to which would best serve his purpose. They would then be able to define the exact districts, in conformity with the wishes of the members. If once they got the thing going, it would find its own level and sphere of usefulness, and the districts would shuffle themselves on to the proper lines.

The resolution was unanimously carried.

The President: I congratulate you on that unanimous vote.

Representative for the Council of the Institution.

The President observed that the next business was to elect their representative on the Council of the Institution. The reason they had to do this now was this: Unless a representative was elected before a certain time (he thought fifty days before the Institution general meeting), he could not serve. The election must therefore take place before a certain date. That date was prior to the April meeting of the Association; so that last year, it would be remembered, the Committee had to act on their own responsibility. They much preferred, however, that the members should elect their own repesentative. The one to be elected now

would follow Mr. Dougall, who would go off the Council of the Institution next June.

Mr. J. DAVIS (Gravesend) moved that the President be elected to represent the Association on the Council of the Institution for twelve months from June next.

Mr. RUGGLES seconded; and it was unanimously carried.

The PRESIDENT thanked the members for their confidence; remarking that he would watch over their interests all he possibly could.

PLACE OF NEXT MEETING.

The PRESIDENT then invited the members to meet at Grantham for their spring meeting; and the invitation was very cordially received.

This concluded the business meeting.

VISIT TO THE GAS-WORKS—A PROGRESSIVE COMPANY.

From early morning before lunch, Mr. Brockway was receiving visitors to inspect his works; but the visit according to the programme followed the meeting. Nearly all the members took advantage of the opportunity of making an inspection; for it is no secret that since Mr. Brockway entered office here in 1890, he has reconstructed the works on modern lines, and has incorporated in his system of manufacture several interesting processes.

Going first to the retort-house, it was seen that it contains 66 retorts, in settings of sixes, on Drake's tubular system. The retorts are 22 in. by 15 in. by 10 feet long. Hand charging is the vogue; but the coal is brought in from the point of its reception on the works by overhead conveyors, which deposit it in front of the retorts. In the retort-house, the question of auto-carburation is at once raised by noticing the arrangement by which the blue water gas from the Dellwik plant is introduced into two retorts of each setting. The gas is passed in ⅄ branches into the mouthpieces; and by a hand lever the stoker shuts off the blue water gas at the end of the first two hours carbonization of the charge. Mr. Brockway informs us that he is regularly using 15 to 25 per cent. of blue gas with the coal gas, and has no difficulty in maintaining and sending out a mixed gas of 15½-candle power, without any enrichment whatever, excepting that obtained from picking up the benzol and light hydrocarbons in the crude hot gas. To get the best results, however, it is necessary to vary the method of mixing according to the quantity introduced. Up to say 15 per cent., it is, as the President stated in his address, introduced into the foul main continuously without lowering the illuminating power more than ¼ candle; but if more than (say) 18 per cent. is put into the coal gas at this point, the mixed gas is reduced fully 1 to 2 candles. If therefore (say) 20 per cent. to 30 per cent. of blue gas is required, it is introduced into the coal-gas retorts as soon as the first retort has been charged; and the whole 20 per cent. or 30 per cent. of it is rushed in during the first two hours of the freshly-charged retorts, shutting the water gas off then till the retorts are again charged. By this method, the mixed gas is not reduced by more than ½ candle. In connection with the blue water gas plant, the members were interested in the 30,000 cubic feet per hour Marsh "Rotary" station meter by which the blue water-gas is first measured, and also a small "Rotary" meter of 5000 cubic feet per hour, which measures the gas as it passes to the retorts. The relief holder has a capacity of 130,000 cubic feet.

It may be stated here that the Peebles oil-gas plant has been entirely removed from the building adjoining the retort-house, where it was located, as now under the system of working there is no further use for it. In its place, as we mentioned in a recent issue, a setting of vertical retorts on the Settle-Padfield system is now being erected for the Self-Charging Vertical Gas-Retorts, Limited, by Messrs. Robert Dempster and Sons, Limited, of Elland. The furnace work was well advanced last week. The setting will consist of six retorts, which differ slightly in shape and size from the experimental one erected at the Exeter Gas-Works, to further facilitate the discharging of the coke. The curve in the Cleethorpes retort is more acute. Of course, the experience gained at Exeter in feeding the coal into the retorts has resulted in modifications and improvements to the apparatus to be used at Cleethorpes. In working the Exeter installation, the whole of the six plungers fed coal into their respective retorts at one and the same time; the charges being about 7 lbs. each. The sudden generation of gas evolved so quickly, however, could not be properly dealt with by the exhauster as it was unable to respond to such a large volume of gas so momentarily produced. This difficulty, Mr. Brockway says, has been overcome in the Cleethorpes arrangement by dividing the working of the charging plungers into one-sixths periods of time, so that only one plunger at a time is actually feeding in coal. The heating of the retorts is on Waddell's patent regenerative system, for which Messrs. Dempster and Sons are the sole licensees. The discharging mouthpieces are to be fitted with the firm's patent sliding lids. Elevators and overhead hoppers are also being provided to deal automatically with the coal. Separate apparatus forming a complete testing plant from retorts to gasholder has been fitted up; and there is also to be supplied the necessary plant to deal with the carbonization of the whole of the tar produced. A special building is being erected fitted as a dark room and provided with photometers, calorimeter, and all the other necessary testing appliances. The work is being carried out under the supervision of Mr. Brockway; and, in his own behalf and that of the Self-Charging Vertical Gas-Retorts, Limited, Mr. Thomas Settle, the inventor of the process, is superintending the erection. Professor Vivian B. Lewes, it is of interest to learn, has been engaged to test and report upon the working when the installation has been completed.

Looking round other parts of the works, it is seen that the annular condensers are by Messrs. Robert Dempster and Sons, Limited; the exhausters respectively by Messrs. R. & J. Dempster, Limited, and Messrs. Bryan Donkin and Clench, Limited. A Livesey washer and tower scrubber are in use, as well as one of Holmes's rotary washer-scrubbers. The purifying-house, with the elevated purifiers, is another good piece of structural work. There are three 30 feet square purifiers on Green's system, and two lime catch boxes. The station meter is one of Cowan's make. In addition to the water-gas relief-holder, there is an ordinary guided holder of 260,000 cubic feet capacity; but the Gadd and Mason of 650,000 cubic feet was the centre of attraction in this line. Mr. Brockway's answer to inquiries is that the holder "works perfectly." The sulphate plant is of Schwab's make; and the visitors admired its compact arrangement, as well as the excellent colour of the sulphate that was being produced. The visitors found that the coal-conveyors to the retort-house, and the yard coke-loading conveyor, as well as the coke-breaker, are driven by a 16-horse power gas-engine. The coke-conveyor elevator is an arrangement something like a moving stairway. It simply carries coke up, and cannot be responsible for any increase of breeze or dust. It was Mr. Brockway's idea, and it was made by Messrs. Robert Dempster and Sons. The fittings shop, stores, photometer room, offices, show-room, and other places were visited with keen interest. The impression that the visitors must have carried away was that the works were as complete and interesting as works can well be, and for cleanliness and attractiveness throughout, especially in the machinery rooms, the best ordered works to be found elsewhere, while they might equal them, could not exceed them.

A few figures about the gas business at Cleethorpes. It has had a remarkable development. Only fourteen years ago, the make was 16 million cubic feet; this year will see the total in the proximity of 125 millions. The maximum day's make is 650,000 cubic feet. The price of gas is now 2s. 6d. and 2s. 3d. It has been reduced from 3s. 1d. during the last two or three years. This Mr. Brockway attributes to the economies of the Dellwik water gas and the process of auto-carburation; and we may add that his own energies have not been without effect. The extraordinary progress of the prepayment system is worth a note. The Company have nearly 5000 of these meters connected, as against 1200 ordinary ones. The gas engineers who spent an evening in the town could confirm all the independent views that have been expressed as to the excellence of the street lighting of the town. All the streets are illuminated by incandescent lamps—the principal ones by the Welsbach self-intensifying pattern, and the others by No. 4 Kerns. Thirty new lamps are now going up for lighting the new Parade. The columns are of very fine design; and they each carry in their ornamental bow top one of Humphrys outside four-light burner lamps, of 500-candle power.

In the evening, the members and friends dined at the Dolphin Hotel; the President being in the chair. The Chairman and Directors of the Gas Company were present, as well as Mr. Brockway. An excellent programme of entertainment was provided by the artistes performing at the Pier and at the Empire Music Hall.

On the following day, a party remained, and paid a visit to the Grimsby Gas-Works, under the Engineer and Manager, Mr. J. Broadhead.

Gas-Engine Statistics.

In the course of the lecture which (as notified in last week's "JOURNAL") he delivered at the Newcastle Exhibition, Mr. A. B. Roxburgh, of the National Gas-Engine Company, stated that about one-third of the gas made in Great Britain was used in driving engines; while in the area of supply served by the Newcastle and Gateshead Gas Company there could be no less than 10,000-horse power developed by this means. He estimated that in the United Kingdom alone there were manufactured at least 200 gas-engines weekly. Averaging these at the very low rate of 10 brake horse power each, this would give a weekly production of 2000 brake horse power—a calculation much too low, as the actual amount would be fully double that quoted. With the improvements made in gas-engines, the consumption of gas had been decreased until in Newcastle it was possible to find many engines consuming 16 cubic feet per brake horse power per hour. As a matter of fact, it was quite possible to produce a brake horse power for an hour for as low a cost as one-third of a penny—a price at which it was equally impossible for a steam-engine to compete at any load up to 100 brake horse power, or an electric motor at any power whatever.

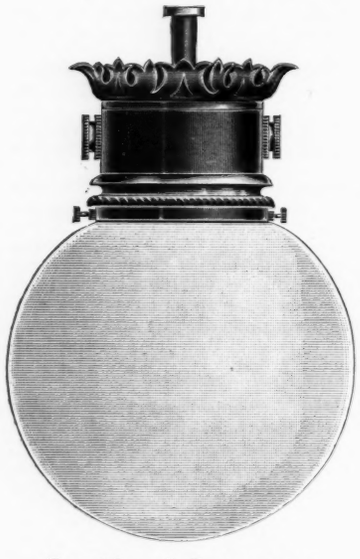
Mr. S. E. Halliwell, the Manager and Secretary of the Littleborough Gas Company, has been elected a Fellow of the Chartered Institute of Secretaries.

THE "LIAIS" REGENERATIVE GAS-LAMP.

It is some time since we noticed the "Liais" recuperative inverted incandescent gas-burner, which has had a very popular reception in France. We have now been introduced, at the office of the "Liais" Light, Limited, 117-118, Long Acre, W.C., to a couple of regenerative inverted burners, which the same inventor has brought out. The new lamps (which have never yet been used in England, except experimentally) are intended for duty in positions of larger area than the smaller form of the burner previously described. One is called the "Lobby" light; and the other the "Arc" light—the former being suitable for such places as lobbies, halls, restaurants, &c., and the latter for workrooms, factories, warehouses, shops, railway stations, halls, street lighting, and, in fact, the situations in which closed and shielded lamps of this kind can be employed are too numerous to mention here. Before, however, giving a brief description of the lamps, we may point out that certain small improvements have been made in the original ordinary type of the "Liais" burner, which has not only improved its appearance, but has increased its efficiency. The burner, it will be remembered, is constructed of aluminium, has an air-regulating screw at opposite sides, and has a very compact appearance. The new lamps are of an altogether larger form; and while, to an extent, the principles of construction of the small original burner have been adhered to, the "Lobby" and "Arc" types have an individuality of their own. Their respective forms are seen by the illustrations.

The "Lobby" light has a short metal chimney above the body of the burner, the globe below is of pear shape, and surrounding the inverted mantle is a dwarf cylindrical glass. The air-inlets are situated in the metal chimney above, quite away from the outlet for the products of combustion; and these inlets are supplied with an interior regulator, which can be operated by means of any sharp-pointed instrument. The effect of the construction is that the air for the feeding of the flame enters at the air-inlets above and passes down through the heated annular space formed by the globe and the glass chimney surrounding the mantle before it reaches the flame; the products of combustion passing away up the central part of the chimney. Thus no air can reach the flame that has not been heated. The bottom part of the lamp is entirely enclosed; and the construction enables it to be used in any position where a lamp is likely to be subject to draught. The lighting is effected at the top of the lamp. The "Arc" form is much the same as the "Lobby" in its general principles, excepting that every part is larger and stronger. The metal chimney too is longer and has a protecting cap at the top, while above the globe is a large, dome-shaped reflector, which performs the dual duty of assisting in the distribution of the light and in protecting the globe.

These lamps have been tested at the Conservatoire des Arts et Métiers, and the tests have been corroborated by a well-known expert in this country. The reports show that the duty may be taken at 27 candles per cubic foot; but 31 candles with the "Arc" lamp was not an uncommon return. With the "Lobby" light, the illuminating power (which, of course, will vary with the pressure of the gas) is placed at 70 candles, and that of the "Arc" light at 130 candles. The light of the latter is certainly intense. The steadiness of the "Arc" lamp in boisterous weather has been proved by a very severe test at Montmarte—the highest part of Paris—where is situated the Conservatoire des Arts et Métiers; and in respect of vibration, the mantles have also given a good account of themselves in trials that have not been in any sense indulgent.



THE "LIAIS" RECUPERATIVE INVERTED LAMP.

Half Size.

THE "LOBBY" REGENERATIVE LAMP.

Half Size.

THE "ARC" REGENERATIVE LAMP.

Quarter Size.

Chemistry for Engineers and Manufacturers.

We have received from Messrs. Chas. Griffin and Co., Limited, a copy of the second edition of a "practical text-book," under the above title, by Messrs. Bertram Blount and A. G. Bloxam. The first edition, published in 1896, was reviewed in the pages of the "JOURNAL" at the time; and this "complete revision" of the work, with "a good deal of new matter inserted," will be noticed in due course.

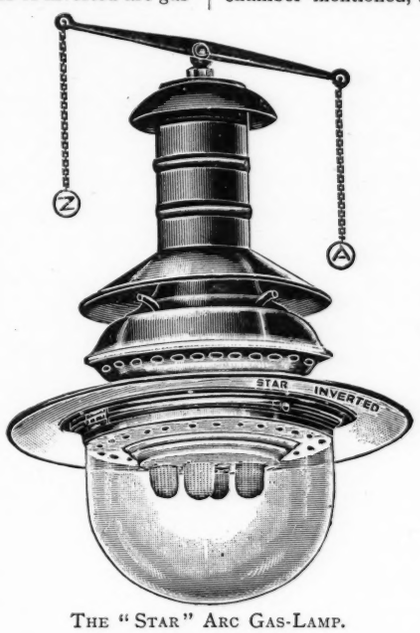
Inspection of Gas-Fittings.

The "British Advertiser"—a chatty monthly appealing (from Queen Anne's Chambers, Westminster) to those who have extensive dealings with newspapers and other periodicals, as also those which have to bring their "wares for sale" before the purchasing public in other ways—has given in its current month's issue a "Suggested Letter" for a gas-fitter, plumber, or such-like tradesman to issue to the inhabitants in his particular district. A copy might well be sent out by gas managers to their local tradesmen, with a hint that its further circulation in the town would likely lead to profitable business. This is the form of letter suggested: "Dear Madam,—With the autumn, one notices an appreciable increase in the gas bills. The evenings draw in so rapidly that it becomes necessary to light up much earlier. At the same time if the increase in gas consumption is very marked, it may be that there is some defect causing a leakage of gas, for which you have to pay. A likely spot for such a leakage is the gas-heater for the bath or else the gas-stoves in the bedrooms and kitchen. Then, again, a good deal of loss is occasioned by the retention of worn-out burners, which allow the gas to be used without giving an equivalent quota of light. The more points you equip with incandescent burners, which consume every fraction of gas passing through them, the greater saving in your gas bills there will be. So many people appreciate the advantage of having their gas-fittings periodically overhauled, that I am making it a regular feature of my business to do this. The saving in undue waste of gas much more than balances my nominal fee. Would it not be desirable for me to assist you in this direction also? I make a charge of 5s. for each inspection, and furnish you with a report. This charge is deducted from any work that may require to be done and with which you entrust me. I await the favour of your instructions. Yours faithfully," &c. Our contemporary adds that copies of this letter can be supplied on a tradesman's own headings, in typewriting colour, or the heading would be printed, and the letter supplied complete, at a moderate charge.

THE "STAR" ARC INVERTED LAMPS.

The accompanying illustration hardly does justice to the general appearance of the largest of a series of inverted arc gas-lamps that the "Star" Inverted Incandescent Burner Company, Limited, are now placing on the market, and to which they have invited attention. It is a good-looking, strongly constructed lamp, which are features that correspond well with an illuminating power that strike one, from a visual test, as being notably high. We cannot, however, guarantee from any other more definite test the statement made by the "Star" Company, that the lighting power is 300 candles per 8 cubic feet of gas consumed; but we can accord publicity to their assertion that they are prepared to give positive assurance on the point, which buyers can, of course, themselves put to photometric proof. Per cubic foot, the ascribed duty is remarkable. However, the consumption itself cannot be more than is stated, as the single-holed nipple-jet employed is made for the passage of 8 cubic feet, though, of course, ordinary changes of pressure would cause this to vary slightly.

The casing of the lamp does not concern us much, and beyond saying that it is of solid copper and enamel, the illustration may be left to do the rest. The gas and air are given more than the usual opportunity for mixing and becoming heated before reaching the point of combustion. The first mixing-chamber is situated at the top of the lamp; and air from outside the lamp is admitted into this through four arms, after the ordinary manner of the "Star" burner, save that two of the arms are placed horizontally, and the others take something approaching a diagonal line. From the chamber mentioned, the mixture passes down the bunsen tube, and then just by the domed reflector it is discharged into a capacious distributing chamber, from which depend four tubes, carrying ordinary "Star" mantles. The mantles are grouped closely together—just sufficient space being left in the centre for four pilot-jets fed by a single bye-pass tube running from the top of the lamp. The burners and mantles are entirely enclosed; the globe (which fits tightly) being carried on a nickeled frame, hinged, and held in position by two springs. Air supply for the burners is admitted above the dome reflector, and finds entrance into the globe through holes close to the periphery of the inner reflector. All parts of the lamp are interchangeable.



THE "STAR" ARC GAS-LAMP.

The lamps of the series of smaller dimensions are made with fewer mantles and air-admission tubes, but give a corresponding illumination per mantle. For example, the two-mantled lamp is credited with a light of 150 candles, at 4 cubic feet per hour. In other respects, the general structural arrangement of the lamps is much the same as the largest size, which we have fully described.

Incidentally, it may be remarked that the Company have lately been issuing a new list of their goods, and are showing some really excellent designs both in incandescent and in ordinary fittings.

JET-PROOF GLASS CHIMNEYS.

The well-known Jena Glass-Works, from which the most refractory chimneys hitherto produced for incandescent gas-burners have emanated, have recently produced a modified chimney specially designed to be unaffected by the jets of flame which often jut out from holes in a mantle. These jets or jutting flames acting continuously upon the same spot of a chimney will soften the most refractory glass; and the Jena firm are not hopeful that it will ever be possible to produce glass which will resist such action. The strains set up in the glass by the local softening due to the impingement of a jet of flame almost inevitably result in the fracture of the chimney. On the other hand, it seems unlikely that mantles will be produced which do not sooner or later split or open, so that points of flame pass through them.

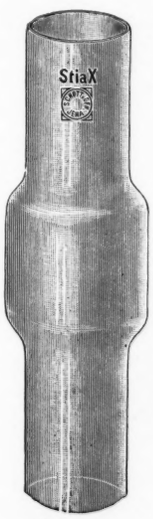


FIG. 1.

FIG. 2.

Bearing in mind these considerations, the Jena firm has designed the two chimneys shown in figs. 1 and 2; and a series of laboratory trials has proved them practically unaffected by the points of flame referred to. Comparisons were first made between an ordinary plain chimney and the bulged chimney shown in fig. 1, at consumptions ranging from 3·675 to 4·725 cubic feet per hour, while the mantle had a hole at (1) its lower part, (2) its middle, and (3) its upper part. The ordinary chimney showed signs of severe strain, evidently accompanied by softening of the glass, when the hole was in the upper part of the mantle; but the bulged chimney was not affected, owing to its wall having been expanded until it was beyond the reach of the point of flame. The bulge is about 2½ inches in length. Comparisons were also made in the same manner between the chimney shown in fig. 2 and the ordinary six-hole perforated chimney, which is specially subject to the attacks of flames jutting out from holes in the lower part of the mantle, and striking the glass between two holes. It was found that reducing the size of the holes, and increasing the number from six to twelve (by adding a second series closely above the first), gave the chimney the desired immunity from the attacks of jets of flame. It was ascertained that the changes in the chimneys had no effect on the light yielded by the mantle. The new patterns should have a good future before them, if practical use confirms the laboratory results; and the firm of Schott and Genossen, of Jena, are to be congratulated on their untiring efforts to improve the glassware for gas-burners.

Calcium Carbide Regulations in Ceylon.

The "Ceylon Government Gazette" recently contained amended rules, made by the Governor of the Colony, to regulate the importation, storage, and transport of calcium carbide. The rules dated Feb. 8, 1902, are cancelled, and the importation is prohibited of calcium carbide which contains impurities liable to generate phosphoretted hydrogen or siliciuretted hydrogen, so as to render the gas evolved liable to ignite spontaneously. Acetylene, when liquid or when subject to a pressure above that of the atmosphere, capable of supporting a column of water exceeding 100 inches in height, and whether or not in admixture with other substances, is to be deemed dangerous, and is prohibited from being manufactured, imported, kept, conveyed, or sold, subject to the following exception: Acetylene in admixture with oil gas in proportion not exceeding 20 parts by volume of acetylene in every 100 parts of the mixture, when subjected to a pressure not exceeding 150 lbs. to the square inch, shall not be deemed dangerous, provided that the acetylene and oil gas be mixed together in a chamber or vessel before the gases are subject to compression. The rules also direct that certain regulations are to be observed by the masters of vessels carrying calcium carbide, and provide regulations respecting its storage and transport.

Masonic.—His many friends in the gas profession and in Masonry will be pleased to hear that, at the annual meeting of the Provincial Grand Lodge of Freemasons of Cheshire, held at Alderley Edge last Wednesday, Bro. William Severs, of the Alan Lodge, Alderley Edge (and Engineer of the Wilmslow and Alderley Edge Gas Company), was unanimously elected Provincial Grand Treasurer.

The Newcastle Gas Exhibition.—It was only to be expected that the comprehensiveness of the exhibition of gas appliances opened in Newcastle-on-Tyne on the 13th inst. by the Newcastle Exhibition, Limited, in conjunction with the Newcastle-on-Tyne and Gateshead Gas Company, of which an account was given in the last number of the "JOURNAL" (p. 761), would prove highly attractive; and therefore we are pleased to learn that up to last Friday evening it had been visited by 15,000 people. Considerable interest has been shown in the working portion of the exhibition—viz., the kitchen, laundry, bakery, &c.; while the lectures and cookery demonstrations have been attended by unusually large audiences. A number of gas engineers, particularly from Scotland, have inspected the exhibits, and have expressed appreciation of their variety and of the artistic manner in which they have been displayed.

COAL-TAR CONCRETE FOR BASEMENTS.

A report issued a short time since from the Insurance Engineering Experiment Station at Boston (Mass.) contains the following remarks on the subject of the use of coal-tar concrete for the basements and ground floors of buildings.

It was formerly, and still is, believed in many cases to be necessary to either put a cellar under every building or else construct a timber and plank floor above the level of the ground. Cellars are apt to be dark, unwholesome, and worse than useless under mills, workshops, tenements, and single dwellings. Spaces of irregular height under basement floors are almost invariably dark and damp, and are unwholesome reservoirs in which foul air is generated. Such cellars and spaces are useless and noxious from every point of view, and may never be tolerated unless rendered necessary for carrying shafting under the floors—usually a bad method. If such air-spaces are provided, they should be made as light as possible, and should be ventilated, even if a forced circulation is required.

The true floor of a basement or of a one-storey factory or workshop should be levelled up above the grade with gravel, sand, or rubble, and should be thoroughly drained. On this base, a thick coating of either asphalte or coal-tar concrete should be spread. Trenches may be made in which timbers may be embedded in such concrete. When a plank floor is required, it may be laid solid on the timbers with concrete, and filled up and swabbed with coal tar, so as to make a complete contact with the underside of the wood, and envelop the timber. Wood laid in this way on asphalte or coal-tar products will last as long as, or longer than, any other wood in the mill.

If only a solid floor is needed, without planking or timber, the concrete may be finished the same as sidewalks are now finished; and in some places concrete made with coal-tar products is proving extremely serviceable in place of pavement on roadways. Since tank bottoms from the California oils and from coal-tar products have lately displaced asphalte, the products of coal tar are mostly in use in laying floors. They are antiseptic, not heat-conducting, impervious to water, and warm to the feet.

THE LEGITIMATE USE OF WATER FOR DOMESTIC PURPOSES.

By K. F. Cooper.

[A Paper presented to the American Society of Civil Engineers.]

The question as to what constitutes a legitimate supply of water for domestic purposes is one in which every water-supply engineer and every water-works official is interested. The following facts and figures relate to the quantity of water used at the Lick Observatory, and show the effect of proper regulation, and of the willing co-operation by consumers, on the quantity used, and how a somewhat limited supply is made to fulfil all requirements.

The Lick Observatory is situated on Mount Hamilton, a peak in the Coast Range, in Santa Clara County, California. Its elevation is 4209 feet; the mean annual temperature is 52°; the coldest month is January, with a mean temperature of 40°; the warmest month is July, with a mean temperature of 69°; the mean annual rainfall is about 32 inches, more than two-thirds of which falls in December, January, February, and March. July and August are usually dry and cloudless.

The observatory is maintained by the State of California, in connection with the State University. The population at the observatory averages 52 people, and consists of the astronomers, assistants, machinists, and labourers with their families. The dwellings, for the most part, are cottages of from four to ten rooms. There are nine families and mess associations.

Two separate water systems are in use. One, a rain-water system, is employed only for fire protection and for developing hydraulic power used in the operation of the large telescope and the platform on which it is mounted. This system will not be considered. The other, the ordinary domestic supply system, consists of springs down on the side of the mountain, from which the water is pumped to two brick and cement tanks, each having a capacity of 80,000 gallons. These tanks are placed on a peak to the east of the observatory, and are 400 feet above the source of supply and 65 feet above the level of the houses. A full and careful record of the quantity of water pumped to these tanks has been kept for a number of years. This amount is computed from gauge-readings in the tanks. These tanks are tight, and well covered; so that the evaporation and leakage amount to little. The average yearly pumpage is 650,000 gallons, or an average of 1780 gallons per day.

As the supply is not great, the consumption and waste have to be looked after very carefully. The main carrying the water from the tanks to the point of distribution is an ordinary 2½-inch iron pipe, ⅝ mile long. There is practically no leakage from this pipe and its connections. The Director of the observatory, Dr. W. W. Campbell, has complete charge of the system; and the rules governing the use of water have to be strictly observed. Any defects in plumbing are reported and repaired at once. As the consumers are interested in preventing waste, regulation is comparatively easy. The water is furnished free to consumers, without any meters or other regulating devices. Seventeen bath-rooms are in use; and in each of them are stationary washstands and closets. Three-quarters of all the bedrooms have running hot and cold water; and the laundries are also provided with running hot and cold water. Wash-rooms and closets are provided for the 6000 or more tourists visiting the observatory annually. A large proportion of the total water supply from the springs is used for photographic purposes. Some water is employed in the operation of a gasolene engine, in the machine shop, in the occasional operation of a steam wood-saw, and for the six horses used in the work about the place. Practically all the laundering for the inhabitants is done on the mountain. During the summer, there is some sprinkling and irrigation. It will thus be seen that, with the exception of the unusually large proportion used for photography, the conditions approximate very closely to those in small towns and in the residence portions of some cities.

Of the 650,000 gallons average yearly pumpage, from one-fourth to one-third is used for photographic purposes. Deducting, say, 30 per cent. for the quantity used in photography—a use entirely distinct from any domestic purpose—there remains 455,000 gallons as the average yearly consumption of 52 people, or a total of 1248 gallons, or 24 gallons per head per day. This, as before stated, includes the quantity used for sprinkling, which amounts to about 5 per cent. of the total, or, say, 32,000 gallons per year; also that used for engines, for horses, and by visitors. The actual consumption for domestic purposes is probably not more than 20 gallons per head per day. The rate of consumption is about the same during the whole year; the users are more careful of the water in the summer, but more is then used for the laundry and for bathing. There is little if any restriction on the legitimate use of the water. All that is needed can be used; but actual waste is almost entirely eliminated.

These facts are worthy of special notice only because the conditions of use approximate those in portions of most towns and some cities; because they give authoritative figures on what constitutes the legitimate use under the conditions represented; and because they show what can be done towards preventing waste by intelligent regulation and the willing co-operation of the consumers.

In considering the *per capita* quantities in the table, it should be borne in mind that the service includes a much larger number of taps (proportionally) than is usual. The proportion of bath-tubs—one to every three persons—is also unusually large. The 6000 tourists per year—not taken into account in the table—must also use a very appreciable quantity of the water. Their average number is 16·5 daily, with a use of water equivalent to perhaps five persons. All tourists, also all provisions, freight, and a daily mail, are brought to the observatory by teams, and these, also, must appreciably increase the water consumption.

Water Supply of Lick Observatory, Exclusive of Fire Protection and Power Purposes.

(The resident population averages 52 persons.)

Consumption for—	Quantity Consumed, in Gallons.		
	Per Year.	Per Day.	*Per Capita* of Resident Population Daily.
All purposes	650,000	1780	34·3
All purposes, except photography.	455,000	1248	24·0
Ordinary domestic uses (estimated)	379,600	1040	20 0

It is probable, therefore, that after eliminating all excess uses of water at Lick Observatory, for purposes not usual in such large proportions in most towns and cities, the quantity remaining for the usual domestic and town purposes (exclusive of fire protection) will not exceed 20 gallons daily per head of the resident population.

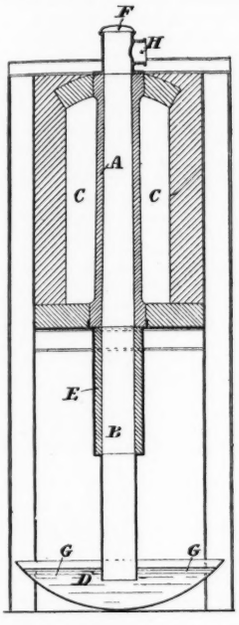
Arrangements are now being made for the installation of the electric light in Hampton Court Palace, not only in the private apartments, but also in those parts to which the public have access. The object is said to be to ensure greater safety from fire; and it is to be hoped that this object will not be frustrated, as has been the case in all too many recorded instances.

Mr. James Fidler, formerly Chairman of the Hyde (Cheshire) Gas Company, who died leaving property valued at £45,252, made several bequests to local charities, hospitals, &c. He also placed £1000 in trust with the Mayor and Corporation of Hyde, to dispense the income annually at Christmas in gifts, either in money or in kind, to the poor of the townships of Hyde and Newton—the recipients to be over 60 years of age, and no two of a family to benefit, neither must they be in receipt of parish relief. The Committee of Selection is to be drawn from the municipal authorities; but no member of the Labour party is to be on the Committee, and the names of the beneficiaries are to be given to the Town Clerk 14 days before distribution.

REGISTER OF PATENTS.

Vertical Retorts.—Wilson, W., of Kirkintilloch, N.B. No. 19,774; Sept. 14, 1904.

The invention consists of a vertical gas-retort made in two portions—the upper portion A of fire-brick or other refractory material, and the lower portion B or cooling chamber of cast iron or steel. The upper part of the retort is enclosed in a furnace C, and the lower chamber is exposed to the atmosphere, and its lower end is sealed with a water seal D. Alternatively the lower portion may be wholly or in part lined with fire-brick (as at E) or water-jacketed. Coal is fed into the upper end of the top portion of the retort at F and becomes coked; the coke being withdrawn from the bottom of the lower chamber through the water seal at G.



The coal may be fed into the retort intermittently or else (by a mechanical arrangement) continuously; and the coke may be removed intermittently by hand or continuously by mechanical arrangement.

The steam produced when the hot coke meets the water at D, the patentee points out, passes up through the hot fuel in the cooling chamber and retort, assisting in expelling the coal gas rapidly from the retort and preventing the deposition of hydrocarbons on the side of it; the combined coal and water gases passing out of the retort at H.

Gas-Fire Stoves.—Fletcher, Russell, and Co., Limited, and Neil, J. & W. R., of Warrington. No. 23,333; Oct. 29, 1904.

This invention relates to patent No. 2337 of 1904; the object being to increase the combustion in the rear-portion of the base of the grate. For this purpose, in addition to the air passages as described in the earlier specification, there are a series of holes provided immediately above the horizontal portion of the base of the fire-clay back, through which the air will be drawn in and pass into the fire so as to intensify the heat of the fire. These holes may be used either in combination with the air space between the base of the fire-clay or metallic back and the tube or chamber in which the gas and air are mixed before passing to the burners only, or the other air-passages described in specification No. 2337 may be employed in combination with them, and either with or without the air-chamber at the back of the metallic shell in which the fire-clay or metallic back is placed.

Retort-Furnaces.—Ifö Kaolin-Och Chamottefabriks, A.B., and Mohr, O., of Bromölla, Sweden. No. 5481; March 15, 1905.

This invention relating to retort-furnaces provided with regenerators, has for its object "to better utilize the space taken up by the regenerators and to obtain a higher economy and a better regulation than has heretofore been possible."

In the ordinary way, the primary air current, the patentees point out, is introduced into the furnace and heated by passing through the flues of the regenerator; and this air, after being mixed with steam "emanating from an evaporation box," is conducted through a grate into the producer, where the gas is formed, and whence the latter "passes into a combustion chamber, where it burns with the secondary air, previously heated in the regenerator."

Fig. 1 is a cross-section on the line I. Fig. 2 a vertical longitudinal section on the line II. through the centre of the furnace. Fig. 3 is a vertical longitudinal section on the line III. Figs. 4 to 9 are horizontal sections on the lines IV., V., VI., VII., VIII., and IX. in the left half of the furnace. The path of the primary air current is indicated by featherless arrows, the path of the gases of combustion by feathered arrows, and the path of the secondary air by arrows terminating in a small circle. In order to further increase the clearness, small letters are used to designate the flues for the secondary air and capitals to indicate those of the gases of combustion.

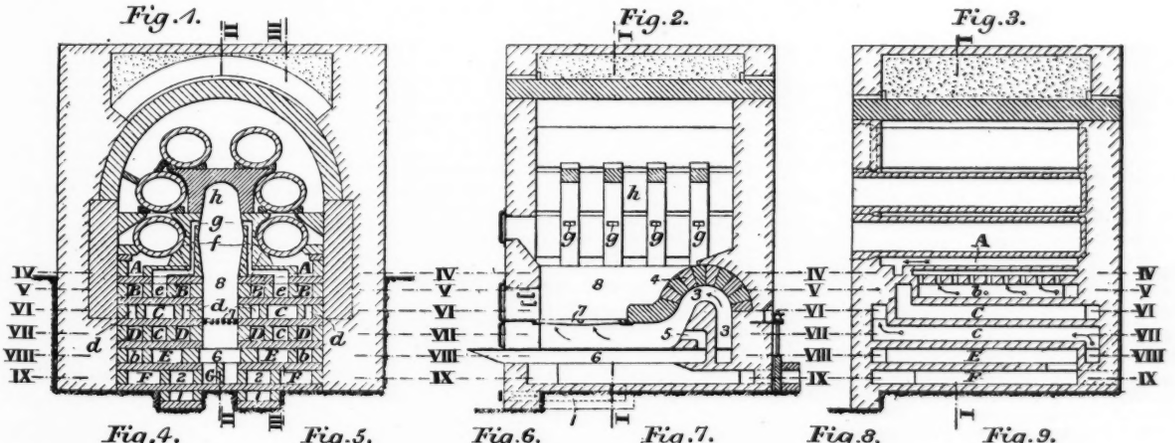
The primary air enters at the front, near the bottom at 1 (figs. 1, 2, 9); from here it passes up through flue 2; thence up through flue 3, below the fire-bridge 4; and finally—having passed by the opening 5 leading from the evaporation box 6—it goes up through the grate 7 to the gas-producer 8.

The secondary air is introduced at the front, near the bottom at *a*; from here it passes up through the flues *b*, *c*, *d*, *e*, *f* and further through the narrow openings *g* into the combustion chamber *h*, where it meets the producer gas.

The gases of combustion pass up along the retorts, on the side of those that are nearest to the centre of the furnace and then downwards along their opposite side, from where it goes down through the flue system A, B, C, D, and E of the regenerator, after which part of the gases leave the furnace through the valve H, while the remainder passes through flues F G and leaves the furnace through the valve J.

The flue G is placed immediately below the evaporation box 6; so that the gas, in passing through G, will evaporate the water. By adjustment of the valves H and J, a larger or smaller part of the combustion gases may be directed through the flue G; and "so it is possible to regulate the amount of steam exactly as desired." The adjustment is made from the outside, by means of the hand-wheels K.

The arrangement of flues in the regenerator is such that the smoke-flues are surrounded by secondary or primary air-flues on all four sides, or at least on three of their sides. This is attained by having in every tier either a smoke-flue in the centre with a flue for secondary air on each side, or *vice versâ*. The smoke passes alternately through a wide flue in the centre and two narrow ones in the next tier below, one on either side. In this manner it is provided that the smoke-flues are on all sides surrounded by air-ducts, so that the combustion gases will better transmit their heat than if—as is the usual arrangement—only the two sides of the smoke-flues were adjacent to the air-flues. This is said to be a very important feature of the invention, on account of the better utilizing of the flue space, which makes it possible either to get along with a smaller regenerator or else to obtain a higher temperature of the air.



Grids for Purifiers.—Spencer, W., of Elland. No. 1576; Jan. 26, 1905.

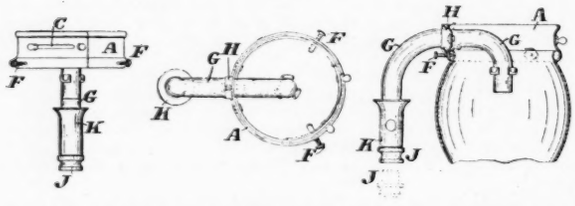
This invention was described and illustrated in the "JOURNAL" for April 18 last, p. 173.

The patentee (before detailing the claim he makes for his invention) states that he is aware that supporting grids composed of oblique ascending rows of triangular and other shaped bars or slabs mounted in a supporting frame have been employed within gas-purifiers for opening up the purifying material. What, however, he claims is: (1) In gas-purifiers the use and employment of "hurdle" like grids composed of a number of stretchers, side pieces, or supports, in which are mounted a vertical or longitudinal row of triangular bars or laths. (2) In gas-purifiers the use and employment of supporting grids having stretchers or side bars, with recesses in the manner and for the purposes detailed in the article alluded to.

Fittings for Inverted Incandescent Gas Lighting.—Bray, J. W., of Leeds. No. 10,570; May 20, 1905.

This invention has for its object the construction and arrangement of a gallery or globe holder, and a bent or curved gas supply-pipe, in such a manner that the variations in the diameter of the flanges of globes are provided for, and the globes may be expeditiously released from, and replaced in, the gallery or globe holder; also that the burner and mantle may be readily accessible for the purpose of examination, renewal, or repair.

The gallery or globe holder A is in the form of a metal spring clip, and is provided with projections, one of which slides in the slot C



formed in the clip. In order that the globe may not be pressed too far through the holder, stops are attached to the interior of it, and have formed therein threaded holes, which correspond in position with holes in the holder, into which are passed screws F of suitable length to engage with the flanges of the globe.

Further, owing to the globe holder being constructed from one piece of thin metal, a thread of sufficient strength to retain the adjustable screws against the expansion of the globe cannot be efficiently formed therein. Therefore the stops are attached to the gallery immediately behind the holes in it, and the threaded holes formed in the lower part of the stops give the desired bearings for the screws F.

The gas supply-pipe or bunsen tube G carrying the mantle, passes through a suitable orifice formed in the globe holder, and is retained in position by a clip or neck H attached to the holder. The bunsen tube fits over a gas-nipple J, which may be attached to any ordinary gas-bracket.

Suitable air-inlet holes are formed in the bunsen tube, and an air regulating device K having holes therein surrounds the lower portion of the tube, as shown.

APPLICATIONS FOR LETTERS PATENT.

18,283.—WILKINSON, G., "Laying gas-pipes." Sept. 11.
18,287.—ROXBURGH, A. B., and RIDLEY, T. P., "Gas and water taps." Sept. 11.
18,301.—REDMAN, T., "Gas-pendants." Sept. 11.
18,305.—BLAKEY, J. W., "Incandescent fittings." Sept. 11.
18 307.—KÖHLER, G., "Gas heating-burners." Sept. 11.
18,311.—BEARD, R. R., "Gas-regulators." Sept. 11.
18,325.—BOULT, A. J., "Generating acetylene." A communication from H. G. Scott. Sept. 11.
18,388.—JOEL, H. F., and STRETCH, I. M'C., "Mantle supports." Sept. 12.
18,391.—HOPKINS, T., "Gas-tap." Sept. 12.
18,442.—CHAPPELL, D. & D. J., and MILLER, T. D., "Gas-burners." Sept. 12.
18,480.—ROSE, A., and BELLAMY, W., "Mantle holders." Sept. 13.
18,535.—HELPS, G., "Gas-pendants." Sept. 14.
18,592.—WRIGHT, H. T., "Turbines driven by power generated by internal combustion engines." Sept. 14.
18,648.—HOGAN, G. L. & I. B., "Carburettors." Sept. 15.
18,685.—PAETOW, H., "Gas-engines." Sept. 15.
18,693.—STANSFIELD, A, and METERS LIMITED, "Prepayment meters." Sept. 15.
18,723.—BROWN, J. H., "Retort furnaces." Sept. 16.
18,725.—PAYNE, S., "Retorts." Sept. 16.
18,742.—GRAETZ, M., "Gas-nozzles." Sept. 16.
18,761.—JUDSON, G. R., "Incandescent burners." Sept. 16.
18,765.—M'RAE, J., and INGRAM, H., "Acetylene generators." Sept. 16.

Gas v. Electricity at Cardiff.—The Cardiff Electrical Committee have received an unwelcome suggestion from the Secretary of the local Property Owners' and Ratepayers' Association, who has written pointing out the advantage of lighting the roads in the Cathays Park and the approaches to the new Town Hall and the Law Courts with incandescent gas-lamps, as compared with electricity. He contended that, by the installation of incandescent gas-lamps, £411 12s. 6d. would be saved in capital, and £805 yearly in revenue. The Chairman of the Committee (Alderman Carey) remarked in regard to the letter that they had got all their electric lighting plant complete; and every penny they paid to the Gas Company was a loss to the revenue of the town.

LEGAL INTELLIGENCE.

Disputed Meter Registration.

At the Lambeth County Court last Tuesday, before his Honour Judge Emden, Mr. E. P. Hewitt moved, on behalf of Messrs. Vogan and Co., for leave to administer certain interrogatories to the South Metropolitan Gas Company. He said that an action was brought to recover the sum of £71 3s. 5d., the balance of a sum of £87 8s. 5d. overpaid to the Company by reason of meters installed in plaintiffs' premises at Mill Wharf, Dockhead, registering too fast. The meters were a 200-light, put up in November, 1898, a 150-light, put up in September, 1901, and a 20-light meter, supplied in July, 1902. The meters were tested by the officers of the London County Council in February and March last, and were certified to register too fast, to the extent of 5·13, 6·10, and 7·53 per cent. respectively. It was contended by Mr. Hewitt that the meters had been registering too fast ever since they were installed; and upon the figures furnished by the London County Council, the plaintiffs had overpaid the defendants to the amount of £87 8s. 5d. The Company had made an allowance for overcharge for the Christmas quarter; leaving a balance of £71 3s. 5d. due. Mr. Passmore, who appeared for the defendants, said that two of the questions proposed to be asked were matters of common knowledge to both sides, and ought to have been put in as formal admissions. On behalf of the Company, it was held that all the rest of the questions were "fishing" or irrelevant. Having read the interrogatories, his Honour expressed the opinion that the inquiry was clearly a "fishing" one. He added that what the plaintiffs desired to get could be obtained in cross-examination. Mr. Hewitt pressed his application in view of the circumstances of the case, and the necessity for obtaining inferential evidence. After some further discussion, his Honour, without calling on Mr. Passmore, said he did not see that he could do anything in the matter. There was not one of the questions that he could allow, according to the ordinary practice, except the two which the defendants stated were matters of common knowledge, and were not necessary for the purpose of interrogatories. Mr. Hewitt might get these by admission. Mr. Passmore had a counter-application for various particulars; and this was granted without opposition. Costs were allowed to the Company.

Water-Rate Collector Charged with Embezzlement.

At Stourbridge, last Friday, Walter Dunn Holloway, a water-rate collector, was charged as the servant of the Stourbridge Water Company, with having embezzled sums of 5s., 7s. 6d., and 7s. 3d., the moneys of the Company. Mr. J. H. Harward prosecuted; Mr. Hinds appeared for accused. Mr. Harward said although the charge only related to three small items it was a serious one. The investigation of Holloway's books showed that there was a sum of £1400 unaccounted for. He was appointed nineteen years ago to collect the water-rates; and it was his duty to keep a register of the amounts due from the customers of the Company, to make out the demand notes, to enter in a cash-book the sums he received, paying the money into the bank from time to time. The sums to which the charge referred related to the quarter ended June 24, and Mr. Harward went on to say that he should show that they were received by prisoner, and not accounted for; but at the end of the quarter they were entered by him as arrears. Mr. R. A. Blurton deposed to a payment of 5s. to Holloway on May 9; Mr. H. Wilcox and Mr. C. Bowkley, to payments on May 10 of 7s. 6d. and 7s. 3d. respectively. Mr. H. Barratt, the Secretary of the Company, stated that not one of the sums named had been entered in the books as paid, but at the end of the quarter were represented as being in arrear. Witness had conversations with Holloway on the 8th and 15th inst. On the latter day, witness asked him to give him the names of one or two people from whom he had received money he had not accounted for. The prisoner gave him the names, among others, of the three witnesses who had been called. He had also admitted making false entries in the books. Witness's inquiries were not made till after Holloway had fully admitted the false entries. Prisoner said he should plead guilty; and Mr. Hinds postponed saying anything on his behalf. The accused was then formally committed for trial at the next Quarter Sessions at Worcester.

Maryborough (Queensland) Gas Company, Limited.—The profit made by this Company in the six months ending the 30th of June, with the balance brought forward, was £1041. The amount available for distribution was £1002; and it was disposed of as follows: Dividend for the half year at the rate of 6 per cent. per annum, £771; balance carried forward, £231.

Birmingham Welsh Water Supply.—At last, the citizens of Birmingham are being furnished with an "All Welsh" supply of water; the recent abundant rainfall in the Elan Valley having rendered this practicable, by filling the three enormous reservoirs there. The introduction of this "A. W." supply (as it is locally termed) has naturally necessitated the making of several important connections between the new service water-mains and the old mains, and a rearrangement of the methods of distribution. In not a few instances, the new supply is passing through the mains in a direction opposite to that in which it formerly proceeded; and this reversal of flow has caused the new supply to scour the old pipes. The Welsh water is more absorbent than the old local supply; and this fact, together with the scouring process, has caused the water to pick up some of the reddish-coloured deposits in the old mains. Recently, it is stated, this has been particularly noticeable in the low-level districts; the water in some cases being very much discoloured, and, when allowed to stand, throwing down a thick, red deposit which has an unpleasant appearance. This is, however, said to be chiefly rust out of the old mains, which will disappear in a short time, as it did in the case of the districts first supplied.

MISCELLANEOUS NEWS.

CROYDON COUNTY COUNCIL AND ELECTRICITY.

Discussion of the Matter Opened and Adjourned.

At the Meeting of the Croydon County Council on Monday of last week—the DEPUTY MAYOR (Alderman Morland, J.P.) presiding—a resolution was introduced on the subject of the recent report of the Lighting and Electricity Committee; but at the conclusion of the remarks of the mover and seconder, the discussion had unfortunately to be adjourned. From the abstract of the report which appeared in last week's "JOURNAL" (p. 757), it will have been seen that the Committee favoured the continuation and an extension of the electric street lighting; and their statements led to the spirited reply on behalf of the Gas Companies concerned (the South Suburban Gas Company and the Croydon Gas Company) which we also reproduced.

Mr. PRICE was the mover of the resolution, which was in the following terms: "That the further consideration of the report on street lighting be reconsidered at a future meeting of the Council; and that, in order that the matter may be fairly considered, the Lighting and Electricity Committee be requested to obtain, from the Croydon Gas Company and from the South Suburban Gas Company respectively, offers for the efficient lighting of the borough, and to submit such offers to the Council." He said it would be remembered that two or three months ago the Committee were requested to consider the matter of lighting, and to make such suggestions to the Council as might tend to a reduction in the cost of street lighting. What had been done to take off the burden of the ratepayers? Nothing. The reduction in respect of the arc lamps from £18 to £17 merely took the burden from one account and put it on to another—it took the burden from the lighting account, and put it on to the electricity account. The Committee stated that, with the exception of London, they found no other place was returning to gas. He did not know how this could very well be said. The question of London had been mentioned very frequently; and everyone knew the expenditure the City of London were now incurring. After experiments with the electric light for over fifteen years, they were now returning to gas. ("No.") Then there was another place—the City of Westminster. On the faith of quotations from a gas company, they expected to save from £2000 to £4000 a year. This was reported in "The Times." Then there was the Victoria Station of the London, Brighton, and South Coast Railway. Formerly this was lit by electricity; but now it was lighted more efficiently by gas, and over £1000 saved. Then there was Islington. Three years ago they were experimenting, and electric lights were installed in one or two roads in the borough; but the fittings had now been removed, and incandescent gas-burners substituted. Then there were Bradford and Liverpool. Liverpool was now lighted by gas; whereas formerly it was lit with electricity. One most conspicuous instance was that of Hull. There, with a very large population, the Corporation, like Croydon, owned the electricity works, and yet arranged for the Gas Company to light most of the streets. Surely this was significant of what was being done in the matter of gas. In Paris and Berlin they had evidently returned to gas; while the latest news he had was that New York was lighted by gas. The case for his motion was chiefly upon the figures. It would be seen by the report that ten years ago the lighting cost the Corporation about £7000; and it now cost over £14,000. That this was due to electricity was clearly shown, because, by the report, they found that 127 miles of gas lighting cost £7062, and 14½ miles lighted by arc lamps cost £7212. That was to say, for about the same amount of light by electricity, 14½ miles cost about the same sum as 127 miles by gas—thus making the cost of lighting by gas average £55 10s. per mile, and that by electricity over £497. These figures were enough to call for inquiry. It had been said that a great saving had been made in various places by lighting by gas; and he anticipated a similar saving in their own borough. He thought that at least 1d. in the pound might be saved. Now, 1d. in the pound meant £3500 per annum. They were not dealing with small amounts, but with thousands of pounds. It would be said, of course, that they had a large amount invested in electric street lighting—about £13,000. What were they going to do with this sum? He thought business men would say that, if they could light very much cheaper by gas than by electricity, this £13,000 must be considered as an unprofitable investment. These were the facts; and he wanted them to appoint a Committee in accordance with the resolution. It was not binding on the Council in any case; it was simply a question of inquiry. Surely, they should look at the enormous present-day cost of street lighting, in contrast to what it formerly was. The report which he suggested could be obtained from the Gas Company, even if they did not adopt it, or partially adopt it, would, he maintained, be instructive in all ways.

The motion was seconded by Mr. MOORE, who said that Mr. Price had made out a sufficient case for inquiry.

Alderman MILLER intimated that he wished to speak on the subject; but as so short a time remained, he would not be able to finish his remarks that evening. It was therefore agreed to adjourn the discussion till an early stage of the next meeting.

The Directors of the Monte Video Water-Works Company, Limited, have declared an interim dividend at the rate of 6 per cent. per annum, free of tax, for the half year ended the 30th of June.

The Gas Committee of the Ashton-in-Makerfield Urban District Council have unanimously resolved that application be made to the Local Government Board for a Provisional Order to alter or amend the Ashton-in-Makerfield Local Board Act of 1875 and the various Provisional Orders relating to the district, for the purpose of enabling the Council to manufacture gas and residual products and to store gas on certain additional land.

INCANDESCENT GAS LIGHTING AT CINDERFORD.

For a long time past, Cinderford, in the Forest of Dean, has felt the inconvenience resulting from the want of a public lighting system; and though the matter was on two occasions brought before the ratepayers, with the view of the adoption of some scheme to be paid for out of the rates, the proposal did not obtain support. The Parish Council, however, were not discouraged; and at a meeting held a few months ago it was unanimously resolved to adopt the Lighting and Watch Act. The erection of the lamps was placed in the hands of the Bilson Gas Company, who have also been entrusted with the lighting, cleaning, and maintenance—in fact, they have full control over the system. The population of the area lighted is 10,800. There have been 32 lamps put up this year; and it is proposed to increase them until the number reaches 150—say by 30 each year. The lamp-columns are of Mannesmann steel; the lanterns are Bray's No. 1 Bagby, all copper; the burners are Bray's nickel; and the mantles are Dr. Killing-Precot's self-lighters. The cost of erecting and lighting the lamps is being defrayed each year out of the rates (no loan having been raised), and it is only 2½d. in the pound; and when the scheme is completed this will be ample for all purposes. The work has been carried out under the supervision of the Company's Manager and Secretary, Mr. James Robb. The first lamp was lighted on the 15th inst.; the ceremony being performed by Mr. P. Baylis, the Deputy-Surveyor of the Forest of Dean. At six o'clock there was a numerous gathering of townspeople at St. John's; and the town band having performed a selection of music, Mr. Baylis started the first lamp amid applause. A movement was then made to another spot, where Mr. J. Kear lighted the second lamp; and afterwards into the heart of the town, where Mr. Baylis brought the third lamp into use. The Chairman of the Parish Council (Mr. J. M'Avoy) proposed a vote of thanks to Mr. Baylis for his kindness in coming to Cinderford to inaugurate the public lighting. Mr. G. Barnard, in seconding the proposition, expressed his pleasure at seeing lights in the town. The vote was accorded with applause; and in acknowledging it, Mr. Baylis said he was glad to find Cinderford lighted at last, and at only a very small increase in the rates.

THE PUBLIC LIGHTING OF MARGAM.

As the result of lengthy negotiations, it has been agreed that the Aberavon Town Council shall supply gas to the Margam Urban District Council on the following terms: The Aberavon Town Council to lay the necessary mains and supply gas for the public lamps in streets enumerated, at the price of 3s. 4d. per 1000 cubic feet net, on the average-meter system; the Margam Urban Council agreeing to pay in addition 5 per cent. per annum on an approximate outlay of £335 during the term of the agreement. The Corporation are to complete the whole area proposed to be lighted by gas by Dec. 31 next. The streets in which the Corporation already have mains are to be forthwith lighted by gas, provided the Corporation agree to give the required supply to the lamps at the rate of £3 per lamp per annum, commencing in each case from the time the service is laid on by the Corporation. The term of the agreement is to be ten years, with a minimum rental of £600 a year, not to become payable until 200 lamps are lighted by gas; but the Council will not object to pay a *pro rata* minimum until the 200 have been set up. The Committee of the Aberavon Town Council recommend that application be made to the Local Government Board for sanction to borrow the sum required for laying mains and services in the streets in the Margam districts proposed to be publicly lighted by gas, and at present without such mains and services; and that the work of laying the same be commenced and completed as soon as possible after the loan is sanctioned.

OIL SUPERSEDES GAS IN SOMERSET.

Gas Company and Council.

Owing to a dispute with the local Gas Company, Midsomer Norton is about to take a retrogressive step in the matter of public lighting. During the coming winter the inhabitants, who have been accustomed to see the streets lighted by gas, will have to find their way about by such aid as an installation of oil-lamps (fixed at the more important places) may be able to afford them. The change is, however, it should be remarked, only intended to be temporary; and it is to be hoped the parties will soon come to an agreement which will permit of a return to a system of lighting that is more in keeping with present-day requirements than that which is now being introduced. In the course of a lengthy article, the "Bristol Evening Times" fully explains the unfortunate deadlock that has arisen; and from this we have gathered the following particulars.

The trouble, it is stated, has been caused by an attempt on the part of the Company to increase the price of gas by 3d. per 1000 cubic feet. The lighting season at Midsomer Norton is from Sept. 1 to May 14; the lamps not being used during sixteen weeks of the summer months. Formerly the Company entirely managed the matter, receiving 35s. or some similar sum for each lamp; but just after the close of the South African war, an agreement was entered into by which the Company contracted to supply the gas for 4s. 3d. per 1000 cubic feet during the first year (at the conclusion of which it was expected that the price of coal, raised in consequence of the war, would have fallen), and 4s. per 1000 feet for the other two. There was also to be a minimum consumption of 5000 feet per lamp per season. In due course, the agreement expired; and the Surveyor to the Council (Mr. W. Bevan) wrote to the Company asking them to quote a price for the supply of 100 lamps—94 ordinary and two standards of four and two jets respectively—for another three years, on the same conditions as were contained in the previous agreement. The Company replied that they were prepared to enter into such an agreement on the following terms: The

Council should take at least 7000 feet of gas per lamp per annum; the charge to be 4s. 3d. per 1000 feet for each lamp up to 7000 feet, and beyond this quantity 4s. per 1000 feet. This meant an increase of 2000 feet per lamp yearly; but as during the three previous years the amount burnt by each of the ordinaries was 6911 feet in 1902-3, 7489 feet in 1903-4, and 6793 feet in 1904-5, it was in round figures just about the quantity likely to be consumed. On the other hand, the prospects of the ratepayers benefiting by the lower price charged after the 7000 feet, was infinitesimal; the probabilities being that very little (if any) more would be required. The Council replied that they were not prepared to agree to consume the minimum suggested, nor to pay 4s. 3d. per 1000 feet; but they made an offer to pay 4s. per 1000 feet for gas that was actually consumed. The Company declined this, but said they would reduce the minimum to 6800 feet per lamp. This did not meet with the approval of the Lighting Committee, who offered to guarantee a minimum of 6500 feet per lamp per season, at 4s. per 1000 feet for that quantity, or more if actually consumed. At the same time the Committee recommended that in the event of the offer not being accepted, the Surveyor should purchase 25 oil-lamps, and arrange for erecting and lighting them in the most important positions. The Company intimated that they could not make a reduction in the charge of 4s. 3d., but that they were prepared to meet the Council on the question of the minimum of 6500 feet. This the Council thought unacceptable. The total sum paid to the Company for gas last year was £140; and it was estimated that the proposed increase would have amounted to £8 odd. It is this trivial sum that has led to the trouble.

The Council contend that they are already paying a higher price for their lamps than the neighbouring town of Radstock; but the Company point out that the Radstock Council own the lamps, pillars, and a considerable portion of the mains, and have to pay a large sum yearly in interest and maintenance. The pillars and lamps in Midsomer Norton entailed a capital expenditure on the Company of £400; and the Council have the use of them free. Then again the assessment of the Company having been recently increased, they have to pay about £20 more in rates than formerly. Of this £20, £12 goes to the Council in district rate. Now the Gas Company ask the Council to pay an extra 3d. per 1000 cubic feet for their gas, producing £8, so that on the deal the Council are £4 to the good. "So," concludes our contemporary, "in an endeavour to reduce an increase of taxation, so far as the district is concerned, from £12 to £4, the Gas Company are losing an order of £140 a year, and may in addition be put to the expense of removing the standards; the Council, in refusing to pay an additional £8, with the odd shillings, are taking light from those they represent."

MONAZITE SANDS.

Some interesting particulars as to the various proprietary rights in monazite sands territory are given in a recent issue of the "Sunday Times;" and though much that is stated is not altogether "news" for gas people, it may be interesting to many to reproduce the article, practically speaking, in its entirety.

For some time—and particularly during the past two or three years—capital has constantly been called upon for investment in the exploitation of monazite mines, or deposits, situate in the Brazils and parts of North America. The most recent public pronouncement on the subject is an interesting allusion by Sir George Livesey at the South Metropolitan Gas Company's meeting. It is, therefore, important to know something about the value, production, and application of monazite sand.

Monazite sand contains minerals, among which is thorium in small percentage. This thorium is used in the form of nitrate in the manufacture of incandescent mantles. Thorium came from Norway and Sweden, in the first instance, as an item of commerce. Subsequently, about ten years ago, it was superseded by supplies found on the coast of Brazil in deposits sufficiently extensive to satisfy the requirements of the whole world at a very cheap price; and, as a consequence, the considerable capital invested in Scandinavian mines was lost, and the mines were all abandoned.

The monazite sands on the Brazilian coasts, however, became a monopoly, ably handled by an American gentleman, Mr. John Gordon, a partner of the British firm of Ed. Johnston, Son, and Co., of London and Rio de Janeiro. This gentleman delivered monazite sand in Europe at a price something like £25 per ton for sands yeilding a 5 per cent. average of thorium oxide.

The manufacture of thorium oxide became a speciality confined to four large German chemical firms and the Welsbach Company of Vienna, controlled by the British Welsbach Company. These firms provided thorium oxide for the whole European market, and also sent large quantities to the United States. In the States, the American Welsbach Company also manufactured thorium, but not from Brazilian sands, as a protective duty of $125 per ton enabled the American Welsbach Company to use local produce from the State of Carolina—a supply, however, more expensive to mine than the Brazilian supplies.

In the year 1902, Mr. John Gordon concluded an agreement with the four large manufactories in Germany, according to the terms of which he engaged himself to supply monazite sand to these four firms only, and this at a price of £30 per ton. He also was to have a percentage of the profit resulting from the manufacture of thorium. This compact is known as the "German Thorium Convention;" and, in consequence of this convention, the price of thorium nitrate rose about 100 per cent.

The areas from which Mr. Gordon drew the bulk of his supplies of the raw material are situated directly on the coast—partly his private property and partly controlled under agreements with the Brazilian States of Bahia and Espirito Santo for the exploitation of the sand deposits.

In the year 1903, the Central Government of the United States of Brazil found out that, according to the old law, the right of exploiting sand lying along the coast was not within the power of private persons, or, indeed, of individual States, but exclusively belonged to itself (the Central Government), under an interpretation of the law to the effect "that all the foreshore within a distance of 33 metres from a defined water-mark is the property of the Central (or Federal) Government."

Now, as the tide runs inland very far, *viâ* estuaries and rivers, it naturally followed that the Federal Government could declare an enormous margin under their definition of foreshore rights; and Mr. Gordon was promptly interdicted from exploration of the sand. At the same time, however, the Federal Government of the United States of Brazil issued a lease for the exploitation of foreshore sands on the Espirito South Coast to the highest bidder—a certain Mr. Schmitzspahn—who, however, allowed his contract to lapse, which was, therefore, declared dissolved. In the summer of 1903, a new lease was issued, again to the highest bidder. About this time the South Metropolitan Gas Company had its agent, Mr. Tysoe, in Rio de Janeiro, with the object of negotiating with the Government for a reasonable lease of the sand areas; it not being known for what reason the South Metropolitan Gas Company sought the business.

At the competition, the highest bidder was the firm of A. C. de Freytas and Co., of Hamburg, who offered to pay the Brazilian Government as rent 50 per cent. of the selling price obtained by them for monazite sand; the export of same to be at least 1200 tons yearly. This offer endangered the situation existing between Mr. Gordon and the German Thorium Convention; but negotiations took place, and a new convention between Gordon, De Freytas, and the German Thorium Convention was concluded on the following lines: The total requirements of monazite sand for Europe and the United States—of a standard of 5 per cent. of thorium oxide—are 1200 to 1500 tons yearly; and the Convention agreed that half of the monazite sand should be supplied from Mr. Gordon and half from De Freytas and Co., with a percentage allowance to Messrs. Gordon and De Freytas and Co. of the profits obtained from the thorium produced. Both parties engaged themselves to supply monazite sand to the four manufacturers within the Convention.

This arrangement brought several factories in Germany to a standstill; and in consequence various vigorous efforts were made to find supplies of monazite in Brazil, Carolina, &c., independent of the Convention.

On the coasts of Brazil, there is enough known monazite to cover all requirements for the next 20 to 30 years. In the interior of the country there are also enormous deposits; and in spite of this abundance efforts are made in many other directions to destroy the Thorium Convention.

Gordon, as well as De Freytas and Co., hold in Hamburg and in other ports stocks of about 9000 tons of monazite sand. In January this year, Gordon shipped 1000 tons from Bahia to Hamburg; and between January to July A. C. de Freytas and Co. shipped 2500 tons from Espirito Santo. Such large shipments of thorium can only be consumed by years of trade. Further, as a result of French enterprise, two rival monazite mines have been opened up in the Brazilian interior, each with a present output capacity of about 500 to 600 tons yearly; and consignments from this source are already on the way to Europe. At the present juncture, therefore, the Thorium Convention may be regarded as in jeopardy.

The hitherto existing high price of thorium has also tempted persons in the United States of America to take up the business of producing it on a large scale. So far, of all the States, Carolina alone produces monazite sand—a result of work done from time to time by the Welsbach Company (U.S.A.), two American Companies, one German Company, and (as now announced), by the South Metropolitan Gas Company, of London. In the interest of this latter Company, a quarry has been lately purchased near Shelby at a price of some $45,000. This quarry was refused, after examination, by various American and European firms, but is now stated to contain veins of monazite sand, and great efforts are being made to prove this by means of deep pits. Whether this will be successful, remains to be seen. It is quite certain, however, that the production of sand will prove expensive.

But there is no doubt that the total production of thorium in America is increasing—thereby diminishing the export of thorium from Europe.

The situation is therefore as follows: The total requirements of monazite sands for Europe, including the export of thorium from Europe to America, is 1200 to 1500 tons yearly. Messrs Gordon and De Freytas alone could easily raise their production to 10,000 tons per annum, which is far beyond all possibility of consumption. Yet the search for new sources of supply is active, and not without success. It follows that the market in monazite sand will cease to be profitable in the near future. A small outlet for Gordon's surplus stocks has been a contract recently arranged to supply 1000 tons to the Welsbach Company of Vienna. This Company wil lsatisfy an important consumer for many years; so that the large stocks held in Europe are in themselves sufficient to glut the monazite market at any moment. The German Thorium Convention, due to expire in 1907, is, therefore, hardly likely to be renewed.

Already to-day the Thorium Convention find considerable difficulty in placing their production at the former remunerative prices. Moreover, American manufacturers of thorium are trying to sell their production in Europe; and an agent sent recently to London failed to effect any sales. It is hardly possible, therefore, that the public—much less the trade—can be deluded into speculations in monazite by the ubiquitous promoter. There is thus every probability of the public being able to obtain monazite cheaply, while the promoter of the Monazite Companies will find his task more than difficult.

A Defect of the Unemployed Workmen Act.—The Woolwich Borough Council have instructed the Town Clerk to prepare a memorial to the King, calling his attention to the widespread distress arising from lack of employment, and to the fact that the Unemployed Workmen Act cannot be operative unless means are found for giving employment to the workmen who will register under it, and urging him to call Parliament together for the purpose of passing supplementary estimates for works of public utility (as afforesting, the improvement of harbours, means of transit, water supply, &c.), by which the men who are in distress for want of work may be beneficially employed.

THE DISCOVERY OF COAL GAS.

In the course of a communication to the "Manchester Courier" on the subject of the discovery and application of coal gas for lighting and other purposes, "T. N." relates the following interesting facts.

The earliest recorded observations of the properties of carburetted hydrogen, or, as it is more familiarly called, "coal gas," are given in the "Philosophical Transactions" for 1667, in a communication by Thomas Shirley. It appears from this that Shirley resided at Wigan; and having had his attention directed to "an odd spring" about a mile from that town, he visited it in company with others. Here he observed that the water of this spring, at a certain part, "did boyle and heave like water in a pot upon the fire," though, on putting his hand into it, he "perceived it not so much as warm." Again, applying his hand to the surface of the water, he found "a strong breath, as it were a wind," to bear against his hand. Persons in the neighbourhood had previously applied a light to the surface, and asserted that "the water of the spring did burn like oyle." In this surmise they were in error, as Shirley perceived; and to convince them that it was not the water that burned, he caused a dam to be made so as to hinder the flow of fresh water, and that which was already there he drained away. "Then, applying a burning candle to the surface of the dry earth . . . the fumes took fire, and burned very bright and vigorous." The cone of the flame ascended a foot and a half, the base being "of the compass of a man's hat about the brim." He then caused a bucketful of water to be poured on the fire, by which it was presently quenched, proving to the bystanders that it was not the water that burned, but the fumes issuing through the ground. And he concludes: "I did not perceive the flame to be discoloured like that of sulphureous bodies, nor to have any manifest scent with it. The fumes, where they broke out of the earth, and prest against my hand, were not, to my remembrance, at all hot." These appear to have been the extent of Shirley's observations on coal gas. They are interesting to us as spectators from our higher ground of vantage; but, except that the "fumes" were supposed to have proceeded from the underlying coal so plentiful in the district, and that they fired on the application of a light, we learn nothing as to their character.

Of much greater interest and value are the experiments of Dr. Clayton, Dean of Kildare, on the products from coal. These were undertaken about the end of the Seventeenth Century; but it was not until 1739 that the letter describing them appeared in the "Philosophical Transactions." He also found the gas issuing from the ground in the neighbourhood of Wigan, and lighted it, as did Shirley. But he went a step further. Reasoning inductively, he took some coal and distilled it in a retort in an open fire, with the result that, to use his own quaint description: "At first there came over only a phlegm, afterwards a little black oil, and then likewise a spirit arose which I could no ways condense." This "spirit" forced the lute and broke his glasses. Once when it had so forced the lute, coming close thereto in order to try to repair it, the "spirit" which issued out caught fire at the flame of the candle, and continued burning "with violence as it issued out in a stream, which I blew out and lighted again alternately several times." He then "had a mind" to try if he could save any of this "spirit;" and with this view he took a receiver, and putting a lighted candle to the pipe of this vessel while the "spirit" arose, it caught flame, and "continued burning at the end of the pipe though you could not discern what fed the flame," which he blew out and relighted several times. Pursuing his experiment, he fixed a bladder, "squeezed and void of air," to the pipe of the receiver. The "oil and phlegm" descended into the receiver, but the "spirit" ascended and inflated the bladder. The gas still continuing to come over, he filled a good many bladders with it, "and might have filled an inconceivable number more, for the spirit continued to rise for several hours, and filled the bladders almost as fast as a man could have blown them with his mouth, and yet the quantity of coals distilled was inconsiderable." Continuing his investigation, he kept the gas in the bladders for a time, and endeavoured in several ways to condense it, but in vain; and when he "had a mind" to divert strangers or friends, he would take one of the bladders, prick a hole in it with a pin, and "compressing gently the bladder near the flame of a candle till it took fire, the spirit would then continue flowing till it was compressed out of the bladder—which was the more surprising, because no one could discern any difference in the appearance between these bladders and those which are filled with common air."

Other investigators extended the knowledge of the products of coal; but there does not appear to be any recorded instance of any application of this knowledge, except by way of experiment, and as a matter of curious observation, until William Murdoch so applied it at Redruth, in Cornwall, in the year 1792. However praiseworthy the efforts of the early investigators may have been, they pale beside those of Murdoch, who, by his foresight, his energy, and his inventive genius, made lighting by means of coal gas an economical success.

LAMBETH WATER-WORKS COMPANY (IN LIQUIDATION).

A General Meeting of this Company was held at the works, Brixton Hill, on Friday last—the Right Hon. Viscount HAMPDEN, G.C.M.G., presiding.

The SECRETARY (Mr. H. Wilkins) having read the notice convening the meeting, the report and accounts were presented. In the course of the former, the Directors referred to their proposal to set aside a sum not exceeding £8000 for the general remuneration of officers and workmen who at the time of the transfer of the undertaking to the Metropolitan Water Board were in the service of the Company, and had been employed for not less than three years. Several proprietors having taken exception to this proposal, a test action was brought to ascertain the legal powers of the Company in the matter. It was tried by Mr. Justice Warrington, who, while expressing sympathy with the object, declared that nothing in the nature of a gift could be granted from the Company's funds. The Directors went on to say that difference of opinion might naturally and legitimately exist as to the expediency of making a general grant; but the proprietors would probably unanimously agree that "some slight recognition of exceptionally long and faithful service would not be out of place." They pointed out that there were eleven officers and workmen who at the time of the transfer had completed forty years' service; three having been with the Company for upwards of fifty years. Under the scheme drawn up for the distribution of the compensation, an unappropriated balance not exceeding £500 was placed at the disposal of the Directors. This balance amounted to £485 19s. 4d. (subject to possible small expenses); and the Directors proposed to distribute it among the officers and workmen referred to, in such proportions as they might determine.

The CHAIRMAN moved the adoption of the report and accounts, and observed that they were really the final statements. He thought that the stockholders were to be congratulated upon the result of the arbitration on the transfer of the undertaking. A reference to the "distribution of compensation account" would show that £4 8s. 5d. allotted to the Company for £4 0s. 8d. was sold for £4 5s. 10d., which was a very satisfactory figure. He thought that the Directors were to be congratulated on having made a good bargain for the proprietors, although they had, of course, been assisted by the market. They obtained the stock at about £91 6s. 6d. per cent.; and it was now worth about £98 per cent.—a rise of £6 13s. 6d. per cent. in twelve months. On the £4,260,000 of the compensation accepted in the form of water stock, this meant an addition to the capital value of £311,406. In other words, a holder of £300 of 10 per cent. or of £400 of 7½ per cent. stock in the Company could now sell the stock representing his holding in the Company at more than £65 above the cash value placed upon it by the Court of Arbitration. He then referred to the paragraphs in the report relating to the Directors' fees, and to their proposal for recognizing the services which had been rendered by certain of the officers and workmen. Continuing, he said that the stockholders might remember that, when the meeting was held on May 24, 1904, the Board voluntarily proposed that they should take half fees for the liquidation, and this was agreed to on a vote being taken. At that time, however, it was not at all suspected that the liquidation would be delayed; they had thought that it would probably be completed within twelve months from June 24, 1904. Delays, however, had occurred, over which the Board had had no control—delays mostly occasioned by the action of the Government Auditor; and the liquidation had consequently been put off. The Directors had therefore made a proposal as to their fees, to which, he thought, no legitimate objection could be taken. The Board had no doubt that the stockholders would sympathize with them in their desire to do what was possible to recognize the long services which had been rendered to the Company by certain officers and workmen; and he had no doubt the stockholders would unanimously agree to what the Directors proposed.

Mr. F. E. MUNTZ seconded the motion, which was at once agreed to.

The proceedings then terminated.

HALIFAX WATER SUPPLY.

Visit to Walshaw Dean.

Last Wednesday the members of the Halifax Town Council paid their annual visit to the water-works in course of construction at Walshaw Dean—being met by the Engineer, Mr. Hill, of Messrs. G. H. Hill and Son, and the Resident Engineer, Mr. L. Patteson. There are three reservoirs, which, when completed, will add 700 million gallons to the Corporation storage, and will bring the total up to 2050 million gallons. The embankment of the upper reservoir is practically completed, except for the road and wall over the top; while at the middle reservoir the refilling of the trench is about up to stream level, or 80 feet below bank level. It is at this trench that the most difficulty has been met; and two wing trenches have had to be constructed so as to correct a defect in the strata. The lower reservoir embankment is about 50 feet below top bank level. The total amount of earthwork taken into the three embankments is about 216,000 cubic yards. The excavation of the trenches at all three embankments is completed; and the total amount of material moved has been about 110,000 cubic yards. The greatest depth below the surface of the ground has been about 160 feet, and the least 65 feet. The concrete put in the trenches up to the present amounts to 25,000 cubic yards, and 9000 tons of cement have been used in these and other works. The three trenches have so far taken 65,000 cubic yards of puddle. The area from which it has been removed is about 18 acres, and almost 51,000 cubic yards of cover have had to be moved to get the clay from the farm adjoining the Corporation land. Peat to the extent of 68,000 cubic yards has been removed from the inside of the reservoirs below the bottom of the beaching level, and the beaching done amounts to 33,000 cubic yards. The total cost of the reservoir is expected to be somewhere about £300,000.

We learn from the Hon. Secretary of the Northern District Gas Companies' Cricket League (Mr. C. O. Banks) that the past season was most successful; keen interest being taken in all the matches. The champions were the Commercial Gas Company's Club, who played ten matches, won nine, and lost one; giving them 18 out of a possible 20 points. Southgate came next with ten matches, of which they won eight, giving them 16 points. The other results were: Enfield, 11; Tottenham, 7; Lea Bridge, 5; and Hornsey, 3. Mr. Banks says the officials of the different Companies took great interest in the play of their clubs during the season, and did what they could to improve the ground they played on. The Lea Bridge Club are fortunate in having a good ground adjoining the works, which he believes was presented by the Directors. It is intended to have a social meeting shortly, for the purpose of presenting to the Commercial Club the shield given by Mr. A. E. Broadberry, to hold for the ensuing year. Mr. Banks hopes, with the assistance of the patrons, to be able, after paying outstanding accounts, to show a good balance, and to present the winning team with medals.

PROTECTION OF WATER AREAS IN GLAMORGANSHIRE.

The question of the protection of the local water resources, which was referred to in the "JOURNAL" a fortnight ago, was discussed by the Glamorgan County Council at their meeting at Pontypridd last Thursday. The matter came up for discussion on a recommendation of the Sanitary Committee, who stated that a large number of District Councils who had been circularized were in favour of forming some joint water authority. A conference of representatives of the District Councils was recommended, with two members from each parliamentary division of the County Council; the last-named members being empowered to take steps towards promoting a Bill with a view to the constitution of such authority. Alderman E. H. Davies, in support of the recommendation, said that they had certainly a prior claim to any other authority upon their water resources. There was no reason why they should love their neighbours better than themselves. They knew perfectly well that, not only was the water supply in many places in the country impure, but it was also insufficient. Sir J. T. D. Llewelyn, who urged the importance of taking immediate steps in the direction indicated, asked whether it was proposed to take action in the next session. The Chairman said this would be done, if the recommendation was agreed to. The proposal was then confirmed, and a Committee elected to deal with the matter.

NEW RESERVOIRS FOR THE TEES VALLEY.

There was a large gathering on Wednesday, at Longnewton, between Stockton and Darlington, when two new reservoirs for the Tees Valley Water Board were formally inaugurated. Sir Hugh Bell, the Chairman of the Board, presided; and the ceremony of opening the valve to allow water to flow into one of the reservoirs was performed by Lady Bell, who was presented, on behalf of the Contractor (Mr. John Scott, of Darlington), with a silver ewer, salver, and pair of goblets. When the construction of these reservoirs was first proposed, it was intended to provide a capacity of 100 million gallons; but owing to the rapid growth of the district, which it was expected would continue, the figure was increased to 230 million gallons. The two reservoirs together measure 430 yards long and 460 yards wide, and provide an area of 40 acres of water, standing at a depth of 21 feet. The site was purchased from Lord Londonderry for £3700; and the contract, which was commenced about seven years ago, has been carried out at a cost of £300,000. This amount is almost double the original estimate, and is accounted for by certain serious difficulties which have had to be overcome. When the boring operations took place, what was supposed to be a solid bottom was struck; but after digging the depth required, it was ascertained that there was a sandy foundation. In order, therefore, to make the reservoirs watertight, it was necessary to cover the floors with concrete to the depth of 9 inches, and to overlay the concrete with a surface of asphalte; while brick walls have had to be constructed at the sides. The water that will be supplied to the reservoirs will, for the present, come from the Hury and Blackton reservoirs of the Board. The chief object of the new reservoirs is to increase the storage of filtered water, so that the district may be tided over periods of drought. Before this extra provision was made, serious consequences would have followed any accident to the supply, for the Board possessed only 36 million gallons in their service reservoirs. The supply of water for manufacturing purposes now amounts to 75 million gallons per week, as compared with 24 million gallons per week in 1879—the first year of the present Board's working. The total supply, manufacturing and domestic, in the former year was 46 million gallons per week, and is now 100 millions. The total available supply before the inauguration of the Longnewton reservoirs was 106 million gallons, or only some 6 million gallons more than the present demand.

Tiverton Water Rights.—The ancient ceremony of perambulating the town leat was carried out at Tiverton recently. The stream which supplies the town with water was presented about the year 1256, and it has long been the custom for the local authorities to guard their rights by perambulating the stream once every seven years. A good deal of quaint ceremony and some horseplay attend the function. On the recent occasion, the procession, which was headed by the Mayor and members of the Corporation, was a very long one. Assembling at a shallow well or receptacle for the water in the centre of the town, a proclamation was read claiming the stream for ever, for the sole use and benefit, and as the right, of the inhabitants. The party then walked the whole length of the leat to its source on Norwood Common, about five miles out of Tiverton. At several places on the way, the proclamation was again read.

Paignton Water-Works Loan.—At a meeting of the Paignton Urban District Council last week, a letter was read from the Local Government Board respecting the application by the Council for power to borrow £41,000 for the completion of the water-works now under construction. The Board said they did not think they could properly extend the term of repayment of this loan from 30 to 60 years, for which the original loan was granted. The Chairman of the Finance Committee (Mr. Rabbich) said that if the Local Government Board adhered to this decision, it would mean a serious addition to the rates. If 60 years were allowed for repayment of the extra money required, the annual charge for interest and sinking fund would be £301; but if the money had to be repaid in 30 years, the sum to be provided would be £934 per annum. It was decided that a deputation from the Council, accompanied by Mr. Baldwin Latham, the Consulting Engineer for the water scheme, should wait on the Board and explain the circumstances under which the original estimate had been exceeded, and explain that the extra work was part of the original cost of the undertaking.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Provost Christie, of Falkirk, in moving, in the Town Council this week, the adoption of minutes of the Gas Committee since July, said they were all pleased to see that their Gas Manager had been appointed Chairman of the spring meeting of Scottish Gas Managers, and also one of the Vice-Presidents of the North British Association. These were honours which, he was sure, were well deserved. They would notice, in the report they had before them for the past year, that the yield of gas per ton of coal carbonized had been 9457 cubic feet—an increase of 197 feet upon the previous year. This was in the right direction. Then gas unaccounted for amounted to 11·22 per cent., or a decrease of 1·32 per cent. This was also in the right direction. They had had an increase of 6,090,050 cubic feet in the quantity of gas manufactured during the year, which was equal to 4·01 per cent. Consumers had increased by 564, as compared with an increase of 435 in the preceding year. He thought these figures were gratifying, and went to show that their business of gas making was progressing favourably. He had to inform them that the new works were nearing completion; and that they hoped to be making gas there next month. The railway would not be introduced by that time; but the works themselves would be finished. The minutes were, after discussion, adopted; and it was resolved to deal with the annual report and accounts at a future meeting.

The annual accounts of the burgh of Alloa have been approved by the Town Council. Those dealing with the Gas Department, prepared by the Manager (Mr. J. W. Napier), show that the capital employed during the year amounted to £33,466, which was at the rate of £327 per million cubic feet of gas made. The make was 102,297,500 cubic feet—an increase of 5,919,800 cubic feet upon the preceding year. Gas unaccounted for increased from 6·74 to 7·11 per cent. The number of consumers was: Ordinary, 2195; automatic, 1446—a total of 3641, or an increase of 395. Gas-engines in use number 58, or an increase in number of four, and an increase in horse power from 551 to 600. The revenue amounted to £14,167, or £197 more. Of this, £10,917 was derived from the sale of gas, or an increase of £679. From coke there was derived £1436, which was at the rate of 3·36d. per 1000 cubic feet of gas made; from tar, £509, or at the rate of 1·19d. per 1000 feet of gas made; and from sulphate of ammonia, £908, or at the rate of 2·12d. per 1000 feet of gas made. The total expenditure was £13,509, which was an increase of £791. There was left a balance of profit amounting to £658, as compared with £1252 a year before. Coal cost £5435, as compared with £5125; benzol, £392, compared with £357; interest required £1104, compared with £958; and sinking fund needed £1592, compared with £1555. The capital expenditure during the year amounted to £2566, and consisted of £465 expended upon works, £1267 upon main-pipes, £473 upon meters, and £360 upon railway waggons. It should, perhaps, be explained that out of the sum carried to net revenue account there was paid £573 as the amount of the deficit upon the working of the electricity undertaking, which accounts for the large reduction in the profit for the year. When the gas undertaking was acquired by the Corporation in 1878, the quantity of gas manufactured was a little over 22 million cubic feet; in 1895 it was 49 million feet; and last year it was 102 million feet. So that the consumption has doubled in the last ten years. The yield of gas per ton of coal has risen from 8360 feet in 1878 to 8763 feet; while the price has fallen from 4s 7d. to 2s. 2d. ordinary and 2s. for power per 1000 cubic feet. A most interesting table is given, in which the day and night consumptions during the months of April to September inclusive are shown for the past ten years. Beginning in 1895, the day consumption was 2,488,700 cubic feet, or 19 56 per cent. of the whole; and the night consumption was 10,232,600 feet. In 1900, the day consumption had risen to 8,459,000 cubic feet, or 34·93 per cent. of the whole, and the night consumption to 15,755,900 feet; while last year the day consumption amounted to 16,167,400 cubic feet, or 44·68 per cent, and the night consumption to 20,018,600 feet. The day consumption has grown steadily year by year during the whole time, and is now, in summer, nearly half of the whole output. When the accounts came before the Town Council, Provost Arrol remarked that they were in every way satisfactory, and showed that the past success and prosperity of the gas-works continued to be well maintained. With the new apparatus for stoking, which would soon be in operation, he had every hope that the profits would in future be largely increased. Alloa is in the favourable position of possessing a very low capital, due to intelligent financing, extending over a long period; and this, coupled with excellent management, enables the gas to be sold at the low price which has been charged for two years now.

Mr. A. Yuill, Engineer and Manager of the Dundee gas undertaking, has submitted a report to the Gas Committee this week, dealing with the effect upon the consumption of gas of the resolution of the Town Council to supply gas-cooking appliances free. In it he stated that between June 22 and the 9th inst. there had been issued 545 cookers, 146 hot-plates, and 235 boiling-rings. The total cost of these appliances had been £1704, giving an average for each of £1 5s. 1d. Last year, during the same period, the total number of cookers issued was 388, at an average price of £2 19s. 8d. No hot-plates, grillers, or boiling-rings were issued by the department till the beginning of the present financial year. In the year which ended on April 30, 1901, there were only 733 gas-cookers and 3974 prepayment meters in use; while on April 30 last there were 2264 cookers and 8637 prepayment meters out. Having recently had before him the idea of placing at the command of all householders a supply of gas for lighting and cooking purposes, Mr. Yuill gave instructions for a special survey to be made; and the inspectors have visited every house in which there is no gas-meter. Part of their duty was to give explanations as to the easy conditions under which a supply of gas could be obtained; and, as a result of the survey, applications for prepayment meters have come in at the rate of about thirty per week. During the past three weeks the orders have

numbered about 500. The outcome of all these arrangements has been, it is stated, that there has been a very large increase in the consumption of gas. At the annual meeting in June last, the estimates for the current year were framed on the assumption that there would be during the year an increase at the rate of 5¾ million cubic feet of gas as compared with last year; but while only 4½ months of the year have elapsed, the increase has already mounted up to 7 million cubic feet. It is thus evident that the new policy may be looked upon as a really well-advised one.

In the last financial year of the Greenock Corporation Gas Department, there was a gross revenue of £45,860, and an expenditure of £36,030, which left a balance of £9830. After payment of an instalment of loan amounting to £5000, the wiping out of an adverse balance of £389 from the previous year, and the meeting of charges for interest and the like, there remains a credit balance of £33, which is carried forward. At the Town Council meeting on Tuesday, Treasurer Brown stated that the estimate for the past year was that they would end with a surplus of £330; and this might well have been realized had the profits from residuals proved at all equal to expectation. But they fell short by £1186. The accounts were adopted. The minutes of the Gas Committee stated that the Manager (Mr. W. Ewing) had submitted analyses of coal; and the Convener and Vice-Convener reported that, after consideration, they recommended the purchase of 8000 tons of Allanton coal at 9s. 11d. per ton. Mr. Mitchell moved that no further purchases of coal be sanctioned until the analyses of other coal which had been obtained had been circulated among the members, for consideration at a future meeting. He complained that the analyses of the coal arranged for had not been submitted to the Committee. Mr. J. M'Onie, in reply, said he did not see why there should be such a bother about that coal, unless it were that any stick was good enough to beat a dog with. Who the dog was he did not know. It might be the Manager. He had no interest in buying any man's coal; but he had an interest, which he always exercised, in buying the best coal for the ratepayers. Mr. Mitchell retorted that Mr. M'Onie had not done so this time. On a division, Mr. Mitchell was defeated; and the minutes were adopted by 17 votes to 3.

In the Edinburgh Town Council this week, Treasurer Brown asked Bailie Mallinson whether, in the conversion of 1950 gas-lamps to the incandescent system, his Committee had decided as to whether burners consuming 2 cubic feet of gas per hour were to be used or those consuming 3 feet. He complained that they were going blindfold into the question, and that they had not received information upon the subject which had been promised them. What they were about to do, he asserted, was in the interest of the Gas Commissioners, and not of the citizens at large. His opinion was that if the mantles were properly attended to they could get as good a light from a 2-feet as from a 3-feet burner. Bailie Mallinson repudiated the insinuation that he was acting in the interests of the Gas Commissioners. He had yet to learn that it was not in the interests of the citizens to improve the street lighting. This Committee had not exhausted their experiments for ascertaining whether there were not certain streets which could be efficiently lighted by 2-feet burners. Treasurer Brown replied that if he had been told the Committee had not completed their experiments, he would have been satisfied.

On Thursday night, Commercial Street, Dundee, was lighted for the first time by incandescent gas-lamps, to make room for which electric lamps have been removed. The lamps are those of the James Keith and Blackman Company, Limited, and give a light equal to 900 candles each, at a cost for gas of 1d. per hour. The street, it is stated, was brilliantly illuminated.

The new water supply for Edinburgh and district will be turned on next Thursday, and not any too soon, for the weather has kept exceedingly dry, and, as reported on Thursday of this week, there has been another decrease in the quantity of water in the reservoirs. A year ago, at this time, there were 2,040,395,000 gallons in store; but the amount has now sunk to 623,627,000 gallons. The decrease during the fortnight since the previous report was no less than 152,404,000 gallons. One of the reservoirs is entirely empty. The position, in fact, is much the same as it was in 1871 and 1872, when the last augmentation was brought in.

The Water Committee of the Aberdeen Town Council have reported that, as the result of their recent visit, they found that the River Dee is extensively and seriously polluted by sewage. The Committee are of opinion that the drinking water of a populous town ought not to be taken from a river running through cultivated and inhabited lands; and they cannot, therefore, recommend the Council to embark on any scheme which has the Dee for its source of supply. The estimated cost of a supply from the Dee below the confluence of the Gairn was stated by Mr. Hawksley to be £710,000. On the other hand, the Committee are advised that, of all possible sources, the River Avon is undoubtedly the one which most recommends itself, having regard to quality alone. Indeed, were Aberdeen to succeed in acquiring that water, it would be able to congratulate itself on possessing one of the finest supplies of any city in the world; for the water is not only above all suspicion of animal contamination, but is, for an upland surface water, most exceptionally free from vegetable matter. The Committee, therefore, after full consideration of all the reports and information placed before them, and after personal investigation, recommend the Town Council that they should apply to Parliament for power to obtain a supply of water from the Avon. The cost of the scheme is estimated by Mr. Hawksley at £835,000, or only £125,000 more than the cost of taking water from the Dee.

Metropolitan Water Board.—At a special meeting of the Board held on Friday—Sir R. M. Beachcroft in the chair—the Water Examination Committee reported that, though negotiations had taken place with Sir William Crookes and Sir James Dewar with a view to the transfer to the Board of their laboratory at Notting Hill and the staff connected therewith, they had not found it practicable to arrive at an arrangement, inasmuch as the proposal made to them included provisions concerning the transfer of the staff, upon which it was impracticable to obtain a report from the Director in the time at their disposal. Stipulations were also proposed as to compensation for loss of office, which did not come under their order of reference, and which could not be submitted to the Finance Committee before Sir William Crookes sailed for South Africa on July 29 last. The result was that the proposal was withdrawn. The Committee now recommended that they should be authorized to expend £400 in adapting a part of the West Middlesex office for use as a laboratory for the purposes of water examination. This was agreed to. A senior chemical assistant was appointed at a salary of £300 a year, and a senior bacteriological assistant at the same figure; and other arrangements were made in regard to the laboratory staff.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 801.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 13	10½	Alliance & Dublin 10 p.c.	21½—22½	..	4 13 4
160,000	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	May 12	6½	Bombay, Ltd. . . .	6½—7	..	4 12 10
140,000	5	,,	6½	Do. New, £4 paid	5—5½	..	4 14 6
50,000	10	Aug. 31	14	Bourne-mouth Gas & Water { 10 p.c. . . B 7 p.c. . Pref. 6 p.c.	29—30	..	4 13 4
251,810	10	,,	7		16½—17½	..	4 0 0
53,200	10	,,	6		15½—16½	..	3 12 9
380,000	Stk.	Aug. 16	12½	Brentford Consolidated	250—255	..	4 18 1
300,000	,,	,,	6⅔	Do. New . . .	190—195	..	4 17 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,750	,,	June 15	4	Do. 4 p.c. Deb. .	103—106	..	3 15 6
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig.	220—223*	..	5 0 0
246,320	,,	,,	8½	Do. A. Ord. Stk. .	160—165*	..	5 0 0
460,000	20	Mch. 30	10	British	43—44	..	4 10 11
100,000	Stk.	Aug. 16	6	Bromley, Ord. 5 p.c. .	119—123	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c. .	89—93	..	4 16 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd	12¾—13¼	+⅛	5 5 8
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
150,000	20	July 13	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	May 31	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Apl. 28	4½	Do. 4½ p.c Pref. .	10¼—10¾	..	4 3 9
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	102—104	..	4 6 7
1,400,000	Stk.	Aug. 31	5⅗	Commercial 4 p.c Stk. .	117—120	..	4 5 0
560,000	,,	,,	5	Do. 3½ p.c. do. .	113—115	..	4 6 11
450,000	,,	June 15	3	Do. 3 p.c. Deb. Stk.	87—89	..	3 7 5
800,000	Stk.	,,	6	Continental Union, Ltd.	118—121	+1	4 19 2
200,000	,,	,,	7	Do. 7 p c Pref.	137—142	..	4 18 7
424,070	Stk.	—	5½	Derby Con. Stk. . . .	124—126	..	4 7 4
55,000	,,	June 3	4	Do. Deb. Stk. . .	108—110	..	3 12 9
486,090	10	July 28	11	European, Ltd. . . .	22½—23½	..	4 13 7
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 5
15,223,235	Stk.	Aug. 16	4⅛	Gas-light and Coke { 4 p.c. Ord. . . 3½ p.c. max. . . 4 p.c. Con. Pref. 3 p.c. Con. Deb.	99—100	−½	4 8 0
2,600,000	,,	,,	3½		92—94	..	3 14 6
3,799,735	,,	,,	4		109—112	..	3 11 5
4,193 975	,,	June 15	3		88—90	..	3 6 8
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	98—101*	..	4 19 0
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	19—20	+½	5 10 0
3,800,000	Stk.	May 12	10	Imperial Continental .	218—221	+1	4 10 6
473,600	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	125—130	..	4 12 4
561,000	Stk.	Aug. 16	10	Liverpool United A . .	224—226	..	4 8 6
718,100	,,	,,	7	Do. do. B .	168—170	..	4 2 4

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
306,083	Stk.	June 29	4	L'rpool Unit'd Deb. Stk.	111—113	..	3 10 10
75,000	5	,, 1	5	Malta & Medn., Ltd. .	4¼—4¾	..	5 5 3
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb..	102—104	..	4 16 2
250,000	100	,,	4⅝	Melbourne 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 31	3⅜	Monte Video, Ltd. . .	11½—12½	..	5 12 11
1,565,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	106—107	..	4 6 5
406,025	Stk.	June 29	3⅜	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	18½—19½	..	5 2 7
52,940	1	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd. . . .	145—148	..	5 8 1
600,000	5	Sept. 14	7	Ottoman, Ltd. . .	6—6⅛*	..	5 12 0
168,255	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	6	Primitiva Ord. . . .	6⅛—6⅜	..	4 8 11
796,980	5	July 28	5	Do. 5 p.c. Pref. .	5⅛—5⅜	−⅛	4 10 11
488,900	10	June 1	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
851,070	10	Apl. 28	7	River Plate Ord. . . .	13—13½	..	5 3 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Apl. 13	7	San Paulo, Ltd. . . .	13—13½	..	5 3 8
70,000	50	July 1	5	Do. 5 p.c. Deb. .	51—53	..	4 14 4
135,000	Stk.	Sept. 14	10	Sheffield A	233—235*	..	4 5 1
209,984	,,	,,	10	Do. B	233—235*	..	4 5 1
523,498	,,	,,	10	Do. C	233—235*	..	4 5 1
126,105	Stk.	Aug. 31	5⅓	Shrewsbury Ord. 5 p.c.	104—106	..	5 3 9
70,000	10	May 31	10	South African	16—17	..	5 17 8
6,250,000	Stk.	Aug. 16	5⅓	South Met., 4 p.c. Ord.	132—134	..	4 2 1
1,895,445	,,	July 13	3	Do. 3 p.c. Deb.	88—90	..	3 6 8
575,000	Stk.	Aug. 16	5⅓	S'th Suburb'n Ord. 5 p.c.	123—126	+1	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	125—130	..	4 4 7
112,533	,,	July 13	5	Do. 5 p.c. Deb. Stk.	132—137	+2	3 13 0
502,310	Stk.	May 12	5	Southampton Ord. . .	111—114	..	4 7 9
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6⅔	Tottenham and Edmonton { A 5 p.c. . B 3½ p.c. . 4 p.c. Deb.	122—125	..	5 0 0
363,020	,,	,,	4⅔		96—93	..	4 16 0
125,000	,,	June 29	4		105—108	..	3 14 1
182,380	10	June 15	8	Tuscan, Ltd.	9¾—10¾	..	7 16 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
30,000	Stk.	Aug. 16	7⅓	Wands-worth and Putney { A 5 p.c. . B 3½ p.c. . C 3½ p.c. . 3 p.c. Deb. Stk.	—	..	—
255,636	,,	,,	6⅔		137—140	..	4 9 3
60,000	,,	,,	5⅓		113—116	..	4 13 6
57,564	,,	June 29	3		82—85	..	3 10 7
745,872	,,	Aug. 16	5	West Ham 5 p.c. Ord. .	104—106	+1	4 14 4
185,000	,,	,,	5	Do. 5 p.c. Pref. .	122—125	..	4 0 0
193,300	,,	June 29	4	Do. 4 p.c. Deb. Stk.	104—109	..	3 13 5

Prices marked * are "Ex div."

CURRENT SALES OF GAS PRODUCTS.

Week ending Sept. 23.

Tar products in the London market remain at about the same level as during the past few weeks. Ninety per cent. benzol has been in very good request, and may be called 9¾d. to 10d. net, per gallon f.o.b. London. There has been a good demand for toluol, but makers have not much to offer. Although a little more business has been done in 60° crude carbolic, 1s. 8d. to 1s. 8½d. per gallon, net, is still the best value to be obtained. Ordinary creosote is firm at 1⅞d. per gallon, net, in bulk, at sellers' works; but there is not much to be had. Pitch seems to be in slightly better demand at 28s. 6d. per ton, net. Sulphate of ammonia is very firm with a good demand; the price being £12 15s. per ton on Beckton terms.

Sulphate of Ammonia.

LIVERPOOL, *Sept.* 23.

There has been a very steady market during the week, all the production having been readily absorbed as it became available at last week's prices; and at the close quotations are slightly firmer, being £12 8s. 9d. per ton f.o.b. Hull, and £12 12s. 6d. to £12 13s. 9d. per ton f.o.b. Liverpool and Leith. In London, business has been done at £12 13s. 9d. per ton, Beckton terms; and prices there are now advanced to £12 15s. per ton. The purchases have been largely made to fill orders for Japan, China, and the British Colonies, and the market owes its firmness chiefly to the support derived from these sources; the demand from other points of consumption having been very limited. For forward delivery, £12 15s. per ton was accepted in Scotland in the early part of the week for January-March delivery; but there appear to be no further sellers thereat.

Tar Products.

LONDON, *Sept.* 23.

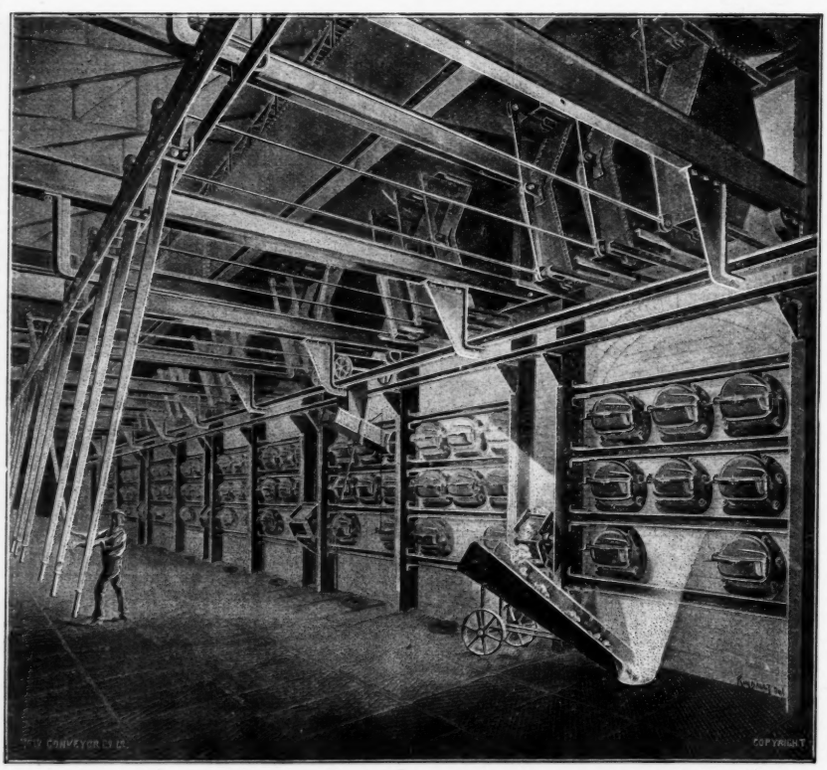
There has certainly been rather more inquiry during the past week; and prices have been generally well maintained. In carbolic acid business has been done at 1s. 8¼d. for September-October in several instances. Manufacturers, however, still decline to sell forward at this price; while consumers profess to believe in still lower quotations for forward delivery. In crystals, a fairly good business has again been done by foreign producers at prices varying from 6d. to 6 1/16d. for 39-40 per cent., which prices, however, English manufacturers are not prepared to accept at present. There is still a strong demand for 90 per cent. benzol for prompt delivery; but London makers are well sold, and it is reported that 9¾d. has been paid for October, while as a rule makers ask 10d. over this period. Business is, however, reported in the North at 9½d. for October-December for export, but only to a limited extent. There does not appear to be much doing in 50-90 per cent. at present, as manufacturers ask prices which consumers are not prepared to pay. Toluol is still in very strong demand, and business has been arranged to a small extent for prompt delivery at 10½d. to 10¾d.; while for forward makers decline at present to quote. There has been a decidedly improved demand for creosote during the past week, especially so far as London is concerned; some quantity of good quality oil having been placed at 1⅞d., while slightly under this figure was accepted for some salty quality. In Yorkshire, the market is also firmer, and several sales have taken place at prices varying from 1⅞d. to 1½d., according to quality. There is a very good demand indeed for all qualities of solvent naphtha, and London makers appear to be fully sold for prompt delivery. There is still some quantity offering in the North at 9d. to 9¼d., according to quality and port of delivery; while business is actually reported in 95 per cent. (160°) at 10½d. for shipment from London. There is a strong inquiry for delivery over next year; but manufacturers prefer waiting a little before contracting. Pitch has been decidedly quiet during the past week owing to a sale having been made by one of the largest London producers at 28s. 3d., which must now be taken as the actual market value, although some of the largest producers still ask 28s. 6d. and even 28s. 9d. per ton. Yorkshire makers appear to be fairly well sold at prices varying from 27s. 6d. to 28s., and are not prepared to entertain business forward except at a slight improvement on these figures. As regards South Wales, there are still buyers for delivery all over next year; but manufacturers do not seem prepared to accept the prices offered by consumers.

The average values during the week were: Tar, 16s. 6d. to 21s. Pitch, London, 28s. 3d. to 28s. 6d.; east coast, 28s.; west coast, 25s. 6d. to 26s. Benzol, 90 per cent., 9¾d. to 10d.; 50-90 per cent., 9¼d. to 9½d. Toluol, 10d. to 10¼d. Crude naphtha, 3½d.; solvent naphtha, 9d. to 9½d.; heavy naphtha, 10¼d. to 10½d. Creosote, London, 1¾d.; North, 1¼d. to 1⅜d. Heavy oils, 2 1/16d. to 2⅛d. Carbolic acid, 60 per cent., 1s. 8d. to 1s. 8¼d. Refined naphthalene, £4 10s. to £8 10s.; salts, 14s. to 16s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market has been firm during the past week, and there has been a very good demand, especially for prompt delivery. Beckton are really not sellers at present for prompt, but would probably accept £12 15s. for October-November; while for delivery next year they ask a slightly higher price. The South Metropolitan Company are in very much the same position as regards prompt business—having little or nothing to offer; but the nominal price may be taken as £12 16s. 3d. on their own special terms. In Leith, there are buyers at £12 12s. 6d. for prompt delivery; and it is reported that business was done early in the week at this price. As a rule, however, makers ask a slight premium upon this figure, and some are quoting as much as £12 15s. for October. Business in Hull is reported to a limited extent at £12 10s. for October shipment. There has been a very fair demand for early delivery at prices varying from £12 10s. to £12 12s. 6d. in Liverpool; but business has been rather limited, as there does not appear to be very much offering at this port.

INCLINED RETORTS.



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33 CONTRACTS COMPLETED.

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AND
W. T. HOLLAND'S
Grit-Proof Bearings.

No Gas-Works is complete unless the above are in use.

Write for Estimates.

NEW CONVEYOR Co. LTD., SMETHWICK.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The Lancashire coal trade is not very brisk at present. There has been some improvement in the demand for coal for domestic purposes; but it has not yet assumed any proportions of magnitude. The Ship Canal traffic has also increased considerably. All this means a greater demand for coal. The outlook is therefore brilliant. The quotations are: Best house coal, 13s. to 14s.; seconds, 12s. to 13s.; common, 9s. to 10s.; steam and forge, 8s. to 9s.; best engine fuel, 7s. 6d. to 8s. 6d.; slack, 7s. to 8s. for better qualities; medium, 6s. to 7s.; common, 5s. to 6s. at the pits. Coal for shipping varies; but for better qualities, prices range from 9s. to 10s. It is reported that a new mine will shortly be opened at Kearsley Moss. Strikes at certain pits in Lancashire and Yorkshire are not yet settled.

Northern Coal Trade.

There is decidedly more activity in the coal trade; a number of orders for Russia for early delivery having been booked, so that the collieries are now very briskly employed. In the steam coal trade, there is a good demand for best Northumbrian kinds at from 9s. 4½d. to 9s. 6d. per ton f.o.b. Second-class steams have been rather heavily sold, and are now quoted at from 8s. 4½d. to 8s. 6d. per ton, and steam smalls are steady at from 5s. to 5s. 9d.; but in some cases these prices are not quite so firm for forward delivery. Other branches of coal very naturally are influenced a little by the activity just referred to, and bunker coals—which influence in a measure gas coals—are firmer. In the gas coal trade, the demand now grows steadily, and the present deliveries will be further increased shortly. While best Durham gas coal is very firm, with quotations that vary from about 8s. 6d. to 8s. 10½d. per ton f.o.b., other qualities are also benefited, and are quoted from about 7s. 10½d. to 8s. 3d. In contracts, there have been one or two concluded for export. It is said that for a limited supply of very best Durham gas coal 9s. per ton f.o.b. has been paid; but this is dependent on the amount allowed for the sea freight, which varies. Coke is very firm, without much alteration in price; and this helps gas coke a little. The production of gas coke is increasing, however, and the prices fluctuate—10s. 9d. to 11s. 6d. having been quoted on the Newcastle Exchange this week, though some sales above are running.

Scotch Coal Trade.

The market continues to be quiet. At present, the outlook is a little better. As matter of fact, forward selling is not favoured by coal-owners, unless at a substantial advance upon current prices. Current values are as yet unaffected. These are quoted at: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. to 8s. 9d., and splint 8s. 6d. to 9s. The shipments for the week amounted to 263,108 tons—an increase of 8244 tons upon the previous week, but a decrease of 4619 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,610,180 tons—an increase of 432,431 tons upon the same period of 1904.

Warrington and their Water-Works Contract.—The Warrington Town Council met on Monday of last week to receive the preliminary report of the Sub-Committee appointed (*ante*, p. 704) to inquire into the circumstances under which the water-works extension contract has grown from £24,000 to £57,000. It was recommended that a civil engineer be engaged to thoroughly investigate the charges made for work done under contract, and that the choice of the expert be left in the hands of three members of the Sub-Committee. There was an attempt to make the appointment in full Committee; but after a lively discussion, this proposal was defeated and the report adopted.

Progress at Matlock Bath.—Since the purchase in 1896 of the Matlock Bath Gas-Works by the Urban District Council, very satisfactory progress has been made with the business of the undertaking. According to the report of the Gas Manager (Mr. William Jaffrey), which was lately issued, there has been an increase during the year just closed of £804, compared with the takings of the last year during which the Company owned the works. Last year 20,107,000 cubic feet of gas were manufactured, as against 18,709,000 cubic feet during 1895—an increase of 1,398,000 feet, or 7·47 per cent. The large increase in profits is accounted for by reduction in leakage, increased make of gas per ton of coal carbonized, less coal used, more coke sold, and general saving in manufacturing and distribution. The profit made on the gas-works for the year ending March 31, 1905, was £1570, as compared with £1260 in 1904, £1063 in 1903, and £820 in 1902. During the nine years the Council have had the gas-works, they have increased the use of cookers by 718 per cent.

The "Ironmonger" on Recent Metropolitan Gas Legislation.—In an article headed "Gas Companies and the Legislature" in their current issue, "The Ironmonger" says: "The past summer, or, strictly speaking, the last session of Parliament, was a very busy and important time for the Metropolitan Gas Companies, for it has seen the close of a long dispute, which might almost be called a three cornered duel, between the Legislature, the London County Council, and the Companies who supply so-called coal gas within the county boundaries. The quarrel in question concerns the illuminating power of the gas supplied, the method of ascertaining it, and the amount of sulphur impurity which it should be permissible to leave in the fluid sent into the mains; and although the victory won by the gas makers ostensibly refers to the Metropolis alone, its fruits will probably be enjoyed by the industry throughout the kingdom. A victory won by a gas company is often represented by certain organs of the Press as a calamity for the customers it supplies; but at least in the present case, when the matter is regarded dispassionately, it will be seen that no one need suffer from the decision arrived at—the result of the fight being simply that consumers are given a grade of gas at a lower price which is practically as efficient as a more costly kind if only they burn it in the proper fashion." Our contemporary goes on to deal with the changed conditions of gas supply resulting from the introduction of the incandescent burner.

CARRON Cookers

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AGENCIES IN ALL LARGE TOWNS.

Carlisle and the Geltsdale Water Scheme.—The Carlisle Town Council, at a special meeting last Tuesday, accepted the tender of Messrs. Harold Arnold and Son to construct the main reservoir at Castlecarrock, in connection with the Geltsdale water scheme. The cost will be £61,733. The Council have already almost reached the limit of their borrowing powers for the scheme—£153,500—and so it has been arranged that a Bill shall be promoted to enable them to raise a further £100,000.

Derwent Valley Water-Works.—A visit just made to the Derwent Valley by a correspondent of the "Standard" furnishes striking evidence of the progress which is being made there with the great scheme to supply Nottingham, Derby, Leicester, and Sheffield with water. The river, which has been diverted to the east of its original course, will be taken through the dam in a 17 feet culvert, now in course of construction. The dams are being built of rough blocks of sandstone embedded in cement concrete; the stone beng obtained from Grindleford quarry, where the output is 6000 tons per week. Already 300,000 tons have been dispatched. It is estimated that the watershed will yield 50 million gallons per day; and one-third of this will be given to the river as compensation. The model village erected between the two dams now accommodates 800 workmen.

Bexhill Water and Gas Company.—In moving the adoption of the report at the ordinary general meeting of this Company last Thursday, the Chairman (Mr. A. H. Kersey) stated that the sales of water for the six months ended the 30th of June last were considerably in excess of those of the corresponding period of 1904. The gas sales also showed an advance. There was a substantial decrease in the cost of pumping and delivery of the water; and a saving had been effected in the expenditure on the manufacture and distribution of gas. The general expenditure, however, showed a slight increase. The balance of net profit was £3574, compared with £3038 last year. After allowing for fixed charges, there was ample to pay the dividends and leave a small balance. The accounts showed that the undertaking was making decided progress; and the Directors were quite confident in regard to the future. The report was adopted.

Dear Arc Lighting at Festiniog.—A Special Committee of the Festiniog Urban District Council have submitted drastic proposals with a view to reducing the expenditure on public lighting. The Committee recommend the removal of nearly all the electric arc lamps with a lighting capacity of from 700 to 1000 candles, and that their place shall be taken by double incandescent lamps of 32-candle power. At the same time they suggest that existing double incandescent lamps should be reduced to single ones. Mr. D. Williams, in moving the adoption of the report by the Council, said the public lighting now cost £914, as against £250 formerly; and the total candle power was about 28,000, as against 3000. The proposals involved the reduction of the candle power to 14,000. Mr. Owen Jones thought the proposals constituted a hopelessly retrograde movement for a town which had won a reputation for enlightenment. Eventually, by nine votes to six, it was resolved to consider the matter at a special Council meeting.

Gas Displaces Electricity at Banbury.—The Banbury Town Council have decided to request the Electric Light Company to put an end to the existing contract for lighting the public streets with electricity, and to substitute incandescent gas. This resolution was come to almost unanimously.

The Use of the Steam-Roller at Southampton.—The Town Clerk of Southampton has reported the service upon him of a writ by the Solicitors of the Gas Company, claiming (1) an injunction to restrain the Corporation from using any steam-roller in such a way as to injure the mains, pipes, or works of the Company; (2) damages for the expenses incurred by the plaintiffs, and for the loss of gas sustained by them, in connection with the fractures of their mains or pipes by the Corporation's steam-roller; and (3) a declaration that the Corporation are liable for the consequences of the said fractures. He has received another from the Solicitors to the Trustees of the Northam Working Men's Club, claiming £552 damage for the destruction of, and damage to, the buildings and contents on May 1, by an explosion caused by gas escaping from a main broken by one of the steam-rollers belonging to the Corporation, through the negligence of the Corporation or persons for whose acts they are responsible. He has also had one from the same firm of Solicitors, on behalf of Mr. P. F. J. Stutchbury, claiming £176 for damage to property in Northam Road, for a like cause; and letters from the Solicitors to Mr. George Dacre and Mr. Sydney Bathard claiming compensation in respect of injuries sustained in connection with the same gas explosion. The Works Committee resolved that they could not recommend the Council to admit any liability in the matter.

The Price of Gas for Motive Power at Coventry.—A Sub-Committee of the Coventry Corporation Gas Committee have reported in favour of a reduction in the charge for gas used for motive power. They recommend the following scale for adoption: Consumption per quarter 1,000,000 cubic feet and upwards, 1s. 6d. per 1000 cubic feet; over 500,000 and under 1,000,000 cubic feet, 1s. 9d.; over 100,000 and under 500,000 cubic feet, 2s.; under 100,000 cubic feet, 2s. 3d. The Sub-Committee state that the estimated yearly loss by these reductions will be £2300. The actual cost of making the gas at present, excluding interest and sinking fund and other standing charges (which would in any event be about the same), is 1s. 4¾d. per 1000 cubic feet; so that the gas will not be sold at a loss. When the works are transferred to Foleshill, the cost of manufacture will be considerably reduced, and the profit on the gas sold will therefore be greater. The Sub-Committee point out that if the custom of the large consumers of gas for motive power be lost to the gas undertaking, an increase in the price to ordinary consumers would be almost certain to follow, because the standing charges of the undertaking would remain about the same; and the only way of meeting the falling off in revenue would be to make a general advance in the price. They also mention that the course they suggest has already been adopted in many towns. The Gas Committee recommend that the proposal of the Sub-Committee should be adopted by the Council.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ltd.

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W. H. PEARSON, Junr., Deputy-Chairman.
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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 8,150,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

Death from Gas Poisoning.—An inquest was held a few days ago at Poplar on the body of a young man named Alfred Lawrence, who had died from gas poisoning. In the course of the inquiry, the Coroner remarked that it looked as if the deceased had turned the gas out before he went to bed, and then turned the tap round again too far. This showed the advisability of having the windows open at night. The Jury returned a verdict of "Death by misadventure."

A Water Arbitration at Yeovil.—A dispute having arisen between the Earl of Ilchester and the Yeovil Corporation as to whether certain water and land was included in an award under which the former received £5907, an arbitration court was lately held at Yeovil to decide the matter. The Arbitrator has now awarded the property in dispute to the Corporation, and directed that the Earl should pay all expenses connected with the proceedings, and the costs of the award.

Bingley and the Wilsden Gas Supply.—The Bingley Urban District Council have not yet discussed the negotiations between themselves and the Bradford Corporation for the purchase from the latter of the rights of gas supply at Wilsden; the Gas Committee having recommended that the consideration of the question should be deferred for a month. It is reported that the proposal of Bradford is to sell the right of supply and the undertaking for the sum of £19,500; the offer being without prejudice.

The Water Supply of Cuckfield.—A Local Government Board inquiry has been held at Cuckfield relative to the application of the Rural District Council for sanction to the borrowing of £2330 for water-works purposes, and to appropriate £242 the unexpended balance of a previous loan. Mr. Rankine, the Water-Works Engineer stated that if new pumping machinery were not installed, it would be impossible to supply the district next winter; and that the proposed use of suction gas would effect a great saving. A proposal was put forward that a Joint Board should be formed, to include Haywards Heath, Cuckfield, and Chailey; but this met with much opposition. The undertaking was originally acquired by the Council from the Mid-Sussex Water Company; and the total amount spent on the water-works by the Council is £93,018.

Public Lighting of Ramsbottom.—A report relating to the street lighting at Ramsbottom during the season 1904-5 shows that there are at present 477 lamps throughout the district. The total number of lamps on the incandescent system is 272; the whole of the main roads being lit on this system. The cost of the gas consumed by street lighting during the period referred to was £521—and the wages paid amounted to £256; so that the cost of gas supply and lighting amounted to £789. The average consumption per lamp at Summerseat was 4764 cubic feet, and cost £1 14s. 5d. The average at Ramsbottom was 7116 cubic feet, and cost (including wages) £1 12s. 1·8d. The average consumption per hour at Summerseat was 2·84 cubic feet, and at Ramsbottom 4·15 cubic feet. The lamps were lit 1716 hours as against 1765 hours in the previous season. The average consumption of gas per incandescent lamp was 7716 cubic feet, and 6516 feet in the ordinary lamps.

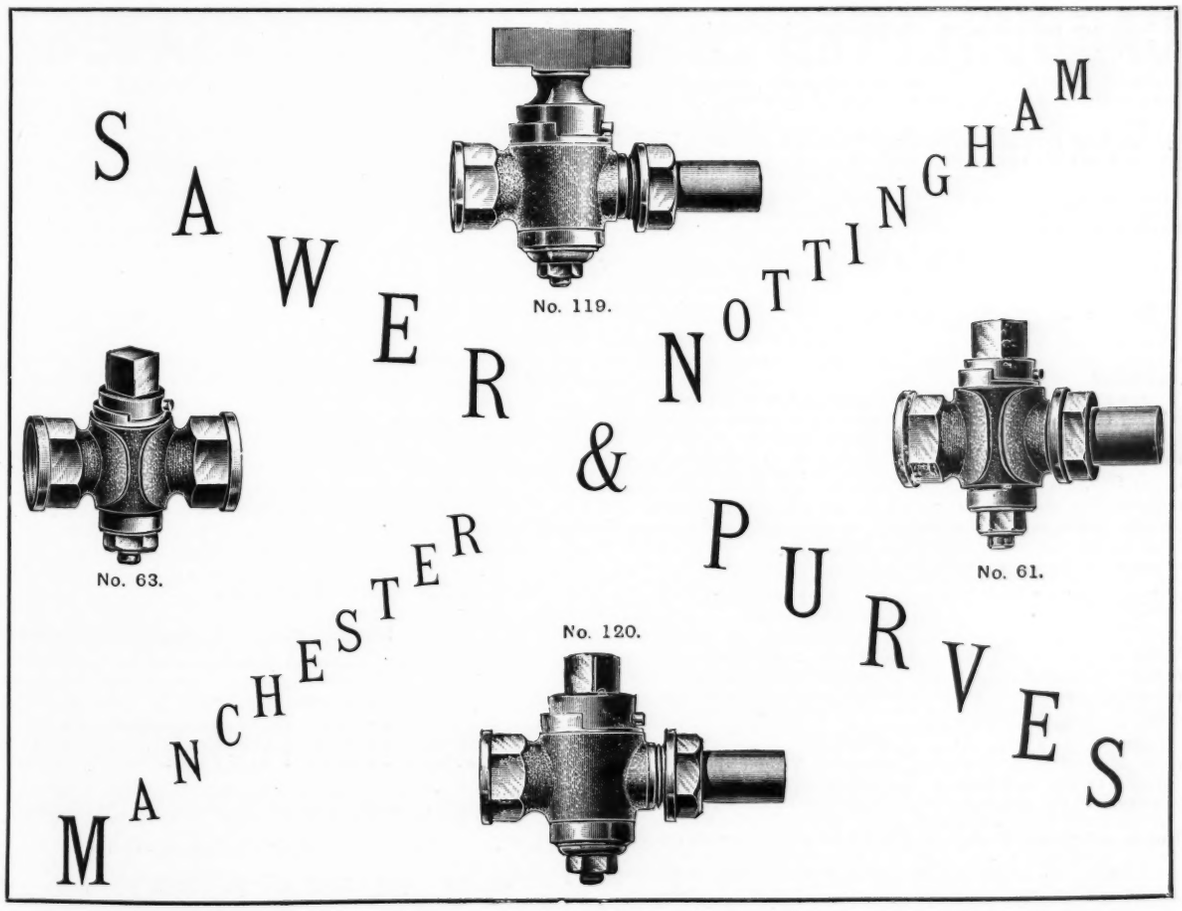
Award in the Bath Water-Works Arbitration.—The award has been given in the arbitration held to decide the amount of compensation to be paid by the Bath Corporation to Mr. A. W. Hick for taking certain springs at Wayfield for the extension of the city water supply (see *ante*, pp. 265, 334). A sum of £3628 was claimed by Mr. Hick; and the Arbitrator (Mr. Daniel Watney) has awarded £1090. This amount the Corporation will pay, *plus* the costs of the arbitration.

Tonbridge Council's Offer of Free Electricity.—We learn that the Electricity Department of the Tonbridge Urban District Council have not received a single application in response to the offer (which was referred to in the "JOURNAL" at the time of its appearance) of free electricity to new consumers during June, July, and August. Possibly the Electrical Committee discovered that they were exceeding their powers; for the advertisement making the offer was withdrawn some time before the end of the term.

Increased Gas Consumption at Torpoint.—At the annual meeting of the Torpoint Gas Company held last Wednesday, Mr. J. Shepheard, the Chairman, said he had been connected with the undertaking as a Director since 1857, and their prospects were never so promising as at present. A large amount had recently been spent in increasing the plant. During the past year the number of consumers had doubled; and the price of gas for cooking had been reduced. In the past six months, 100 cooking-stoves had been fixed.

Gas and Electricity Costs in Port Elizabeth.—A useful illustration of the comparative costs of gas and electricity at Port Elizabeth was furnished last month, when the Committee of the Port Elizabeth Trades and Industrial Exhibition notified exhibitors that arrangements had been made as follows for lighting the stalls: The electric light would be supplied at a charge of 1s. per 16 candle light per evening. The South African Lighting Association would supply gas to each stall at a charge of 3d. per 60 candle power light each evening.

New Joint-Stock Companies.—The Elham Valley Water Company, Limited, has been registered with a capital of £7500, in £5 shares, to acquire the undertaking authorized by the Elham Valley Water Order, 1904; to adopt an agreement with Messrs. E. Easton, E. B. L. Hill, and S. D. Sewell; and to supply water to the parishes of Lyminge, Elham, Postling, Stanford, and Saltwood, in Kent. There will be no initial public issue. The Mazza Separators Company, Limited, has been registered with a capital of £150,000, in £1 shares (10,000 founders'), to adopt an agreement with Mr. E. N. Mazza, to acquire, work, develop, and turn to account any inventions, patents, licences, concessions, and the like, particularly such as relate to the separation of air or any other gaseous mixtures, compounds, liquids, or bye-products, and to carry on the business of engineers, contractors, manufacturers of, and dealers in, coal tar, coke, pitch, asphalte, ammoniacal liquor, and other residual products obtained in the manufacture of gas, constructors of gas-works, &c. There will be no initial public issue.



Skipton Water Supply.—The Skipton Urban District Council have accepted the tender of Messrs. Harold Arnold and Son, of Doncaster, for the construction of the reservoir at the foot of Embsay Moor, in connection with the new water scheme. The amount of the contract is £47,164; and the Engineers are Messrs. G. H. Hill and Sons, of Manchester. The reservoir will be completed within three years.

Sulphur in the Tottenham Company's Gas.—At the meeting last Tuesday of the Tottenham Urban District Council, the Public Health Committee reported the results of the testing of the gas supplied by the Tottenham and Edmonton Gas Company, which showed excesses of sulphur on several occasions in July and August. Under the Company's Act of 1898, no penalty is recoverable unless the excess shall have amounted to 2 grains on the average of six consecutive week-days, or 10 grains on any one day; and the Company's Engineer (Mr. A. E. Broadberry) contended that this limit had not been reached. The Town Clerk, however, dissented from this. In connection with excesses of sulphur which occurred on the 15th and 29th of June, the Committee had decided not to take any action against the Company; but they now recommended this should be done, in order to recover the penalties incurred. The consideration of the report was adjourned.

Termination of the Gas Workers' Strike at Bolton.—After lasting about two months, the strike of gas workers at Bolton has been settled. A meeting of the men was held on Thursday night, and was attended by a deputation from the Trades Council. A long discussion ensued on the point as to the reinstatement of the men; and the deputation gave the assurance that the Gas Manager (Mr. W. Smith) had instructions to start as many as he could in their old positions as soon as possible. Thereupon the men agreed to accept the Committee's terms. These are that machine men get 5s. 4d. per day, an increase of 1d.; elevator engine men, 4s. 3d., an increase of 2d.; coal wheelers, 4s. 1d., an increase of 2d. per eight-hour shift; and yard-men, 23s. per week, an increase of 6d. As to future notice, it was decided that it should expire in the months of April, May, or June. Upon the receipt of notice, arrangements are at once to be put in operation for a conference of the representatives of the Corporation and the men; and in the event of no arrangement being come to within a period of two months, the Trades Council will be approached with a view to a settlement being arrived at in the third month of the notice.

Messrs. Thomas Piggott and Co., Limited, of the Atlas Works, Spring Hill, Birmingham, have secured an order for seventeen of their patent stamped steel tanks for South America.

The Chemical Engineering Company and Wilton's Patent Furnace Company have found it necessary to remove their works to more commodious premises, and have taken a site at the Midland Railway Goods Siding at Hendon, where they will be established as from the 1st of October next.

A set of new purifiers has been erected at the Elie Gas Company's works by Messrs. J. Milne and Son, Limited, of Edinburgh. There are three boxes; and the capacity of the plant is 80,000 cubic feet of gas per day. A rubber joint is used instead of a water seal; and the filling of the boxes is accomplished by means of a shoot.

We have received from the "Colliery Guardian" Company, Limited, copies of the "'Colliery Guardian' Purchasers' Guide and List of British, Indian, and Colonial Colliery Owners," and the "'Quarry' Purchasers' Guide and List of Quarry Owners under the Quarries Act, 1904." The former is corrected up to March 31 last, and the latter to the 1st of July.

The New Inverted Incandescent Gas-Lamp Company, Limited, have sent us their new catalogue, for 1905-6, of incandescent burners and fittings. The Company's "Lobby" lamp is a neat and effective "shadowless" lamp; while their "Cluster" lamp (also shadowless) is suitable for indoor or outside lighting. Fittings, globes, and shades are shown in great variety. The catalogue is very well got up.

There has been introduced into the Australian Parliament, by the Commonwealth Government, a Bill for the registration of trade marks, one peculiar item of which may be noticed—viz., a special section on Trade Union marks, by which any Trade Union of workmen or employers registered under any law of the Commonwealth or of any State may register a mark as a Trade Union mark, only to be used by members of that Trade Union. Any person wilfully infringing the mark is liable to a penalty of £50.

We have received a copy of the supplementary catalogue (No. 231) relating to the gas department of Messrs. Falk, Stadelmann, and Co., Limited. It contains the patterns added to the firm's stock since the publication of their general catalogue, with which it should be used; and a special feature is the large variety of inverted fittings which have been introduced in view of the increased desire for this method of illumination. To meet existing demands for pendants suspended by flexible metallic tubing, which acts as an anti-vibrator, various patterns of these are shown. The firm have produced a range of pendants specially adapted for their high-power burner the "Verax;" and in this connection attention may be directed to a group of lanterns, including the "Verax-Regina," illustrated on p. 32 of the new catalogue.

We have received the prospectus of a competitive exhibition of processes and appliances for lighting and heating by gas and electricity which it is proposed to hold in the show-rooms attached to the offices of "Le Bâtiment," 14, Rue Saint-Grorges, Paris, from the 15th prox. till the 15th of November. The exhibition will comprise the various methods in use for lighting by oil, petroleum, alcohol, acetylene, gas, and electricity, and the appliances employed in connection therewith. Exhibitors will not be called upon to pay any entrance fee, or be charged any rent for the space occupied. They will, however, be expected to put in position, at their own cost, the objects they intend to show. In the case of provincial or foreign exhibitors, the Managers will undertake this work at cost price; and those who require power (gas or electric) will be charged only for the actual quantity consumed. A Jury, composed of authorities in architecture and the special industries concerned, will be appointed, half of whom are to be nominated by the exhibitors and the rest by the conductors of "Le Bâtiment;" and prizes will be awarded. No application for space will be received after the 10th prox.

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WANTED, FOR SALE, CONTRACT, &c. ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

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REPRESENTATIVE HIGH PRESSURE LIGHT. No. 4470.
REPRESENTATIVE (GAS STOVES, &c.) No. 4468.
TRAVELLER. No. 4464.

Situations Wanted.

ASSISTANT TO MANAGER. No. 4469.
WORKING FOREMAN. G. Watson, Torquay.
ASSISTANT ENGINEER. No. 4471.

Stocks and Shares.

CRAYS GAS COMPANY. Oct. 17.
SITTINGBOURNE GAS COMPANY. Oct. 2.
UXBRIDGE AND HILLINGDON GAS COMPANY. Oct. 17.

Plant (Second Hand) for Sale.

HYDRAULIC MAIN, STAND, BRIDGE, AND DIP PIPES, MOUTHPIECES, CONDENSER, WASHER, PURIFIERS, STATION METER, AND GOVERNOR. Peebles Gas-Works.
GAS PLANT, HOLDER, &c. Glover, J. T., Tamworth.

TENDERS FOR

Breeze.

COMMERCIAL GAS COMPANY. Tenders by Sept. 27.

Carbon.

COMMERCIAL GAS COMPANY. Tenders by Sept 27.

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BOLLINGTON GAS DEPARTMENT. Tenders by Oct. 6.

Light Oil.

BRIDGWATER COLLIERIES. Tenders by Oct. 23.

Oil for Gas Making.

TODMORDEN GAS DEPARTMENT. Tenders by Sept. 30.
MANCHESTER GAS DEPARTMENT. Tenders by Oct. 5.

Oxide.

BIRKENHEAD GAS DEPARTMENT. Tenders by Oct. 5.
TYLDESLEY-WITH-SHAKERLEY GAS DEPARTMENT. Tenders by Oct. 3.

Pipes, and Pipe Laying.

SELBY URBAN DISTRICT COUNCIL. Tenders by Oct. 3.

Tar and Liquor.

NEWTON-IN-MAKERFIELD GAS DEPARTMENT, Tenders by Oct. 7.

Valves.

SELBY URBAN DISTRICT COUNCIL. Tenders by Oct. 3.

BOOKS AND LEAFLETS

TO BE OBTAINED OF

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

GAS ENGINEERS' LABORATORY HANDBOOK.—By J. HORNBY. *Price 6s.*

GAS AND FUEL ANALYSIS.—By A. H. GILL. *Price 5s. 6d.*

CALORIMETRY OF PRODUCER AND ILLUMINATING GASES.—By JOHN F. SIMMANCE, Assoc. M.Inst.C.E., M.Inst.Mech.E. *Price 2s.*

CHURCH LIGHTING.— By J. H. TROUGHTON, *Price 9d. per dozen*; 100, 4*s.* 6*d.*

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GAS AND HOW TO USE IT.— By J. H. TROUGHTON. *Sample copies 6d. each.* 100, £2; 250, £4 10*s.*; 500, £7 10*s.*; 1000, £10.

BIRMINGHAM CORPORATION (Windsor Street) GAS-WORKS.—By CHARLES HUNT, M.Inst.C.E. *Price 21s.*

MODERN METHODS OF SAVING LABOUR IN GAS-WORKS.—By C. E. BRACKENBURY. *Price 3s. 6d.*

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THORPE'S DICTIONARY OF APPLIED CHEMISTRY, Vol. 2. Articles on Gas recommended for Students by City and Guilds Institute. *Price 42s.*

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BROTHERTON AND CO., LTD., Ammonia Distillers, Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

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The Cheapest in the Market.
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SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants. We guarantee promptness, with efficiency for Repairs. JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON. Telegrams: SATURATORS, BOLTON. Telephone 0848.

GAS TAR wanted. BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

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RAPID CARBURETTOR—See Advt. in last week's issue.

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WANTED, Re-engagement as Working Foreman, or Main and Service Layer. Practical Gas-Fitter, Sulphate Maker, &c., or any place of trust. Abstainer. Excellent Testimonials and References. Address, G. WATSON, Orchard Cottages, Hele, TORQUAY.

ENGINEER, with Excellent Qualifications and References, good Draughtsman, and well up in Modern Machinery, seeks re-appointment as ASSISTANT-ENGINEER on a Gas-Works. Address, No. 4471, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, post by a young Gentleman (age 24) in a Provincial Gas Company, as ASSISTANT to MANAGER. Experienced in Public Lighting, Incandescent Fitting, Control of Staff, &c. London Experience with large Company. Address No. 4469, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REPRESENTATIVES wanted for High- Pressure Gas-Lighting System in London and Provinces. Send Particulars to No. 4470, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TRAVELLER wanted for the North of England. One with previous Experience and a Good Connection amongst Gas Managers. Apply, by letter, to No. 4464, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REPRESENTATIVE required by First- class firm of Gas Heating and Cooking Stove Manufacturers for Lancs. and Yorks. ground. Must be energetic, up-to-date, and have good connection with Gas Companies and Corporations in the above districts. Apply, by letter, stating Age, Experience, and Salary required, &c., to No. 4468, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ELEVATING AND CONVEYING MACHINERY.

WANTED, Draughtsman accustomed to Designing and Making Detail Drawings for Shops, and taking out Quantities, &c. Reply, stating Age, Experience, and Salary required, to No. 4467, care Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Small Gas Plant Com- plete, including Gasholder of about 8000 cubic feet capacity, in good condition. Can be seen at any time by appointment with Mr. J. T. GLOVER, Estates Office, Canwell, TAMWORTH. Moderate price to immediate Purchaser.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere. J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

PIPES—About 50 Tons, in perfect order, including Specials. Price £3 per Ton; Specials £4 10s., if sold promptly. FIRTH BLAKELEY and Co., Thornhill, DEWSBURY.

TO BE SOLD, Gasholder, 30,000 cubic feet capacity; another 15,000 feet capacity. Both new and ready for delivery. The WRIGHT GAS PLANT COMPANY, LIMITED, 181, Queen Victoria Street, LONDON, and SHIPLEY GATE.

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2 Lengths of Steel Hydraulic Main, 18-in. by 18-in.
18 Stand Pipes, 5-in. to 4-in.
18 Bridge Pipes, 4-inches.
18 Dip-Pipes, 4-inches.
18 Mouthpieces, 18-in. by 13-in.
1 Wall Condenser, 9-inch Pipes.
1 Young's Washer, 6 feet diameter.
3 Purifiers 8 feet square, Dry Centre Valve, 8-inch Connections.
1 Milne's Round Station Meter, 5000 cubic feet per hour, with 6-inch Bye-Pass.
1 Milne's Governor, 6-inch.
Apply to the MANAGER, Gas-Works, PEEBLES. N.B.

THE Urban District Council of Tyldesley-with-Shakerley invite TENDERS for the supply of about 70 Tons of OXIDE OF IRON, to be delivered at the Gas-Works, Tyldesley.

Further Particulars and Form of Tender may be obtained on application to Mr. R. H. Ginman, Gas-Works, Tyldesley.

Tenders to be in the hands of the undersigned not later than Tuesday, the 3rd day of October next.

W. J. MATTHEWS, Clerk.

Council Offices, Tyldesley,
Near Manchester, Sept. 23, 1905.

MANCHESTER CORPORATION GAS-WORKS.

TO OIL IMPORTERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the supply of 5000 Tons of OIL for the Manufacture of Carburetted Water Gas.

Description of the Oil, Conditions of Contract, and further Particulars may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent of the Gas Department.

Sealed Tenders and Samples, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Oil," must be delivered at the Office of the Superintendent of the Gas Department, Town Hall, Manchester, on or before Thursday, the 5th of October, 1905.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order of the Gas Committee,
WM. HENRY TALBOT, Town Clerk.

Town Hall, Manchester,
Sept. 22, 1905.

SELBY URBAN DISTRICT COUNCIL.
NEW WATER-WORKS.

CAST-IRON WATER-MAINS, VALVES, AND SPECIALS.
CONTRACT No. 7.

TENDERS are hereby invited from Pipe Founders for the supply and delivery of about 2¼ miles of 12-inch and 10-inch diameter CAST-IRON WATER-MAINS, including the necessary Valves and Specials.

Copies of the Specification and Bill of Quantities will be supplied on application to the Engineers, Mr. Percy Griffith, M.Inst.C.E., F.G.S., of 54, Parliament Street, Westminster, S.W., and Mr. Bruce McGregor Gray, Assoc.M.Inst.C.E., Council Offices, Selby, Yorkshire, on payment of £5, which will be returned to all Contractors who shall submit a *bonâ-fide* Tender for the work on or before the 3rd day of October, 1905.

Any further Information in regard to the Work can be obtained at the Offices of the Engineers above-mentioned.

Tenders must be made upon the Form provided, and delivered, under seal, to the undersigned by the date above-named.

The Council do not bind themselves to accept the lowest or any Tender.

By order of the Council,
J. H. BANTOFT,
Clerk to the Urban District Council.

Council Offices, Selby,
Dated the 18th day of Sept., 1905.

SELBY URBAN DISTRICT COUNCIL.
NEW WATER-WORKS.

CARTING AND LAYING MAINS.
CONTRACT No. 8.

TENDERS are hereby invited for CARTING, LAYING, and JOINTING about 2½ miles of 12-inch and 10-inch Cast-Iron Water-Mains, and the construction of a CULVERT under the North-Eastern Railway, in connection with the above Works.

Copies of the Specification and Bill of Quantities will be supplied on application to the Engineers, Mr. Percy Griffith, M.Inst.C.E., F.G.S., of 54, Parliament Street, Westminster, S.W., and Mr. Bruce McGregor Gray, Assoc.M.Inst.C.E., Council Offices, Selby, Yorkshire, on payment of £5, which will be returned to all Contractors who shall submit a *bonâ-fide* Tender for the work on or before the 3rd day of October, 1905.

Plans can be inspected, and any further Information in regard to the Work obtained, at the Offices of the Engineers above-mentioned.

Tenders must be made upon the Form provided, and delivered, under seal, to the undersigned by the date above-named.

The Council do not bind themselves to accept the lowest or any Tender.

By order of the Council,
J. H. BANTOFT,
Clerk to the Urban District Council.

Council Offices, Selby,
Dated the 18th day of Sept. 1905.

CARBON.

THE Directors of the Commercial Gas Company are prepared to receive TENDERS not later than the 27th inst. for RETORT CARBON over Twelve Months from the 30th of September, 1905, estimated at the following quantities:

At the Stepney Works on the Regent's Canal, 20 Tons.
At the Wapping Works on the River Thames, 35 Tons.
At the Poplar Works on Bow Creek (free waterway), 50 Tons.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Commercial Gas-Works,
Stepney, E., Sept. 19, 1905.

BREEZE.

THE Directors of the Commercial Gas Company are prepared to receive TENDERS for the surplus BREEZE produced at their several Works for the Twelve Months ending the 30th of September, 1906.

The quantities are estimated to be as under; but the same cannot be guaranteed, and may be more or less:—

At the Stepney Works on the Regent's Canal—
1800 chaldrons (of 20 cwt.) of Rough Pan Breeze.

At the Wapping Works on the River Thames—
4000 chaldrons (of 18 cwt.) of Fine Coke Breeze.
2000 chaldrons (of 20 cwt.) of Rough Pan Breeze.

At the Poplar Works in Bow Creek (free waterway)—
2000 chaldrons (of 18 cwt.) of Fine Coke Breeze.
5000 chaldrons (of 20 cwt.) of Rough Pan Breeze.

The Tenders may be for the whole or for one or more works separately.

The Contractors must give security to remove the Breeze as it accumulates, to pay for the same monthly, and generally for the due fulfilment of the contract.

The Form of Agreement to be signed can be seen at the Company's offices.

Tenders, sealed and endorsed "Tender for Breeze," to be delivered here not later than the 27th inst.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Commercial Gas-Works,
Stepney, E., Sept. 19, 1905,

TO CHEMICAL MANUFACTURERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the purchase and removal of about 200 Tons of Spent OXIDE OF IRON, now lying at the Gas-Works.

Forms of Tender and Samples may be obtained from Mr. T. O. Paterson, Gas Engineer, Gas-Works, Thomas Street.

Tenders, sealed and endorsed "Tender for Spent Oxide of Iron," to be sent in to me not later than 5 p.m. on Thursday, Oct. 5, 1905.

The Corporation do not bind themselves to accept the highest or any Tender.

By order,
ALFRED GILL, Town Clerk.

Town Hall, Birkenhead,
Sept. 19, 1905.

BOLLINGTON URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Coun- cil invite TENDERS for the provision and fixing a 4-in. B.H.P. GAS ENGINE and GAS EXHAUSTER capable of passing 10,000 cubic feet per hour.

Full Particulars will be supplied by the Gas Manager and the undersigned at the Council Offices, the Gas-Works, Bollington.

Tenders, marked "Gas-Engine and Exhauster," to be sent in so as to reach the undersigned not later than Friday, the 6th of October, 1905.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
SAMUEL KNIGHT, Clerk.

Council Offices: Bollington,
Sept. 23, 1905.

TO OIL MERCHANTS AND OTHERS.

THE Gas Committee of the Todmorden Corporation are prepared to receive TENDERS for the supply and delivery of 50,000 to 60,000 Gallons of GAS OIL suitable for Carburetted Water-Gas Manufacture.

Full Particulars can be obtained from the Engineer and Manager.

Tenders, endorsed "Gas Oil," to be addressed to the Chairman of the Gas Committee, and delivered at the Town Clerk's Office, Town Hall, Todmorden, not later than Ten a.m., on Saturday, Sept. 30, 1905.

The Committee do not bind themselves to accept the lowest or any Tender.

HY. HAWKINS, Engineer.

Sept. 20, 1905.

NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the above Coun- cil invite TENDERS for the surplus TAR which may be produced at their Gas-Works for a period of One Year up to the 30th of September, 1906 (approximate quantity, about 500 Tons), delivered in the Contractor's own Tanks, free on rail, at Earlstown Station (L. & N. W. Railway.)

Form of Tender may be had of the undersigned.

Tenders, endorsed "Tar," addressed to the Chairman of the Gas Committee, Town Hall, Earlstown, Newton-le-Willows, to be delivered at my office not later than the 7th of October, 1905.

The Committee do not bind themselves to accept the highest or any Tender.

C. COLE, Clerk to the Council.

Town Hall, Earlstown.
Sept. 22, 1905.

BRIDGEWATER COLLIERIES COKE-WORKS.
(The Earl of Ellesmere.)

TENDERS are invited for the Light OIL produced at the above Works for a period of Six or Twelve Months from the 1st of November, 1905, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley branch of the Lancashire and Yorkshire Railway; or at the Brackley Siding on the Little Hulton mineral branch of the London and North-Western Railway.

Tenders, endorsed "Tender for Light Oil," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Office, 4, Chapel Walks, Manchester, on or before the 23rd of October, 1905.

Manchester, Sept. 26, 1905.

SITTINGBOURNE DISTRICT GAS COMPANY.
(Incorporated by Special Acts of Parliament, 1877 and 1903.)

Particulars of SALE by TENDER of

250 NEW ORDINARY SHARES (1903) of £20 each, entitled to rank for Dividend not exceeding the rate of £7 per centum per annum, being a portion of the New Capital authorized by the Company's Act of 1903.

MINIMUM PRICE, £20 PER SHARE.

£5 per Share to be paid on Tender, and the balance on or before the 1st day of November, 1905.

TENDERS are invited for the purchase of the above Shares. All Tenders to be made on the Company's Form of Tender, and subject to the Conditions therein set out. The price offered to be at per Share,

The Sittingbourne District Gas Company was incorporated in the year 1877, and authorized to supply Gas in a District comprising Seventeen Parishes, in the County of Kent.

The original Share Capital of the Company is £30,000 fully-paid up, the maximum Dividend upon which is 10 per cent. The Dividend for the past two years has been at the rate of £9 per cent. per annum, free of Income-Tax. By the Act of 1903, the Company are authorized to raise additional Share Capital not exceeding £50,000, the maximum Dividend upon which is £7 per cent. per annum, such Shares ranking *pari passu* with the Original Capital except as to maximum Dividend. If in any half year the funds of the Company applicable to Dividend shall be insufficient to pay the full amount of Dividend at the prescribed maximum rate on each class of Shares, a proportionate reduction must be made in the Dividend of each class. Thus the present Dividend on the Original Shares being £9 per cent. per annum, the Dividend on the 1903 Shares is £6 6s. per cent. per annnm, free of Income-Tax. The present Loan Capital is £10,000, carrying interest at £4 per cent. per annum.

The quantity of Gas sold has increased from 30,546,300 cubic feet for the year ended the 31st of December, 1895, to 59,666,200 cubic feet for the year ended the 31st of December, 1904.

The object of the present Sale of Shares is to defray the cost of extension and improvement of the Company's Works, rendered necessary by reason of the large increase in the Company's business.

Tenders will be received at the Company's Office, 76, High Street, Sittingbourne, not later than Monday, the 2nd of October, 1905.

Forms of Tender may be obtained from the Secretary.

By order,
W. J. Harris,
Secretary.

76, High Street, Sittingbourne,
Kent, Sept. 12, 1905.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. Alfred Richards' Offices, 18, Finsbury Circus, E.C.

By order of the Directors of the
CRAYS GAS COMPANY.

NEW ISSUE OF £5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, October 17, at Two o'clock, in Lots.

Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

By order of the Directors of the
UXBRIDGE AND HILLINGDON GAS CONSUMERS' COMPANY.

ISSUE OF 148 £10 SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, October 17, at Two o'clock, in Lots.

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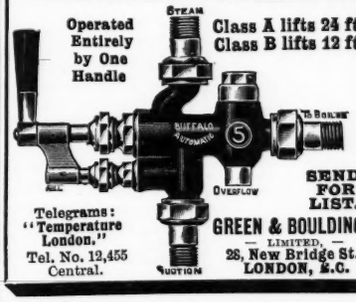

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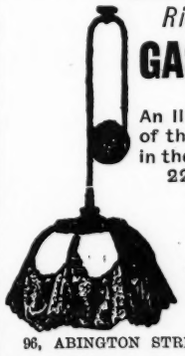

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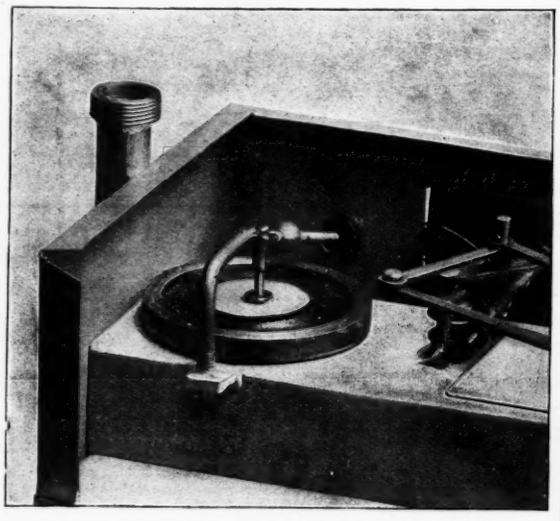

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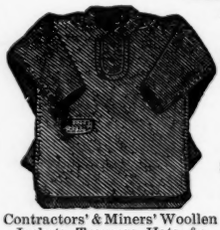

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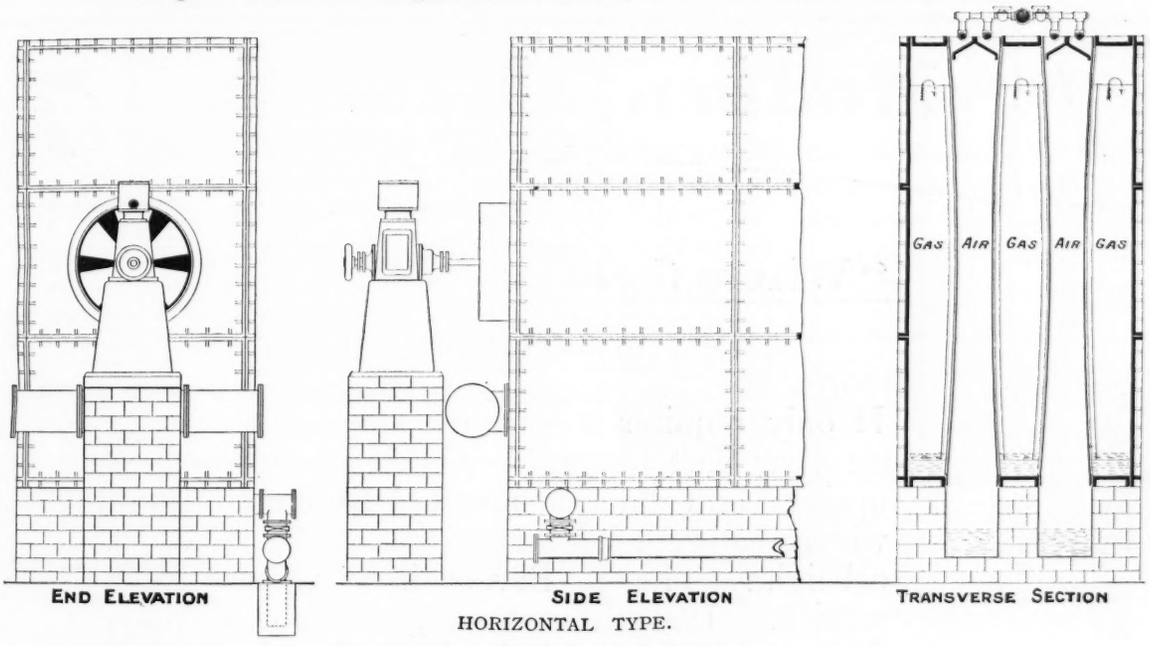

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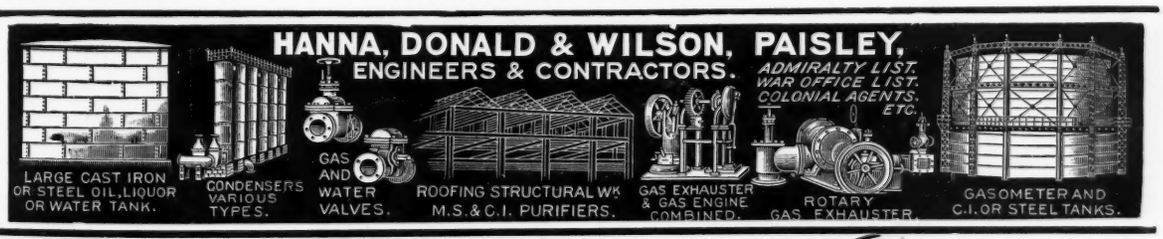
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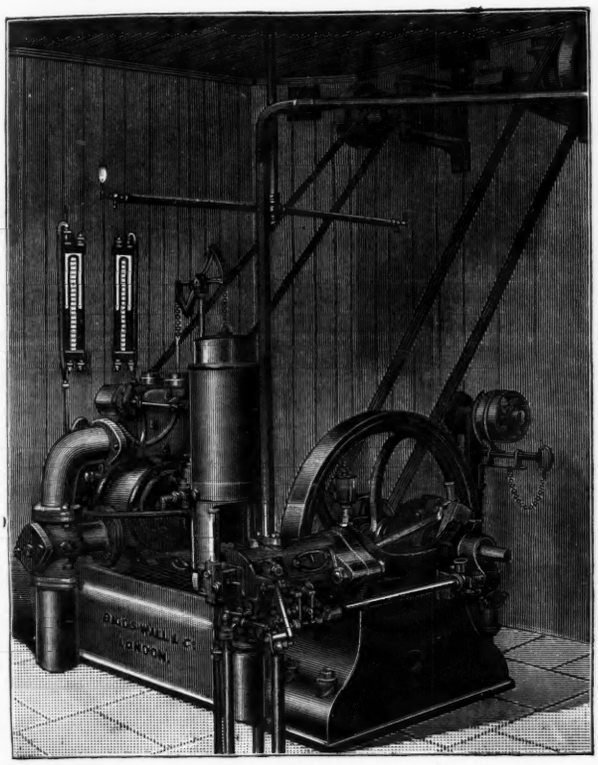

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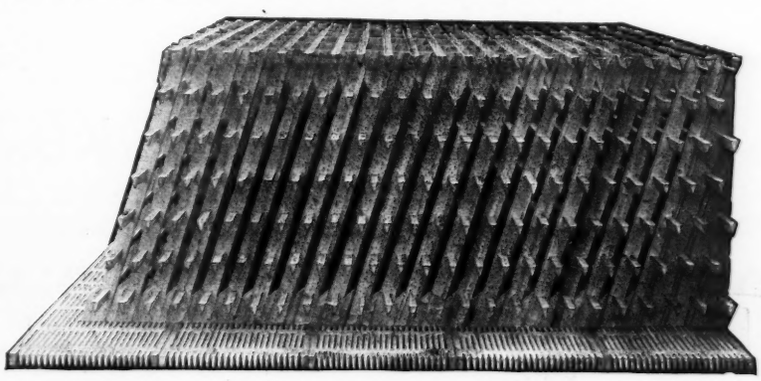

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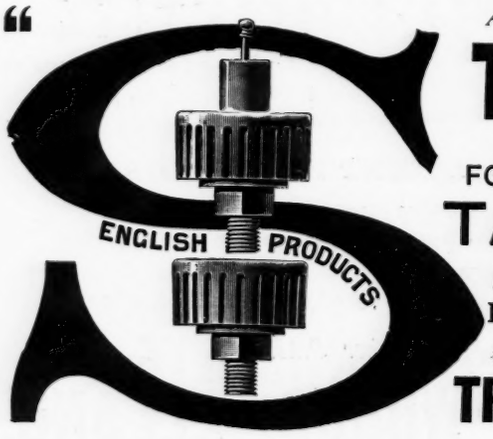

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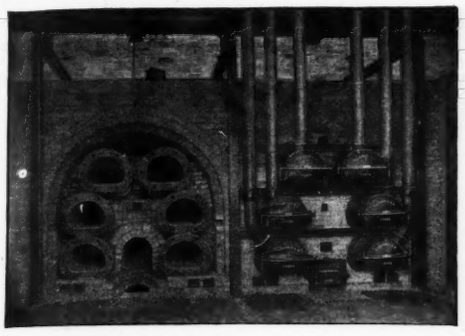

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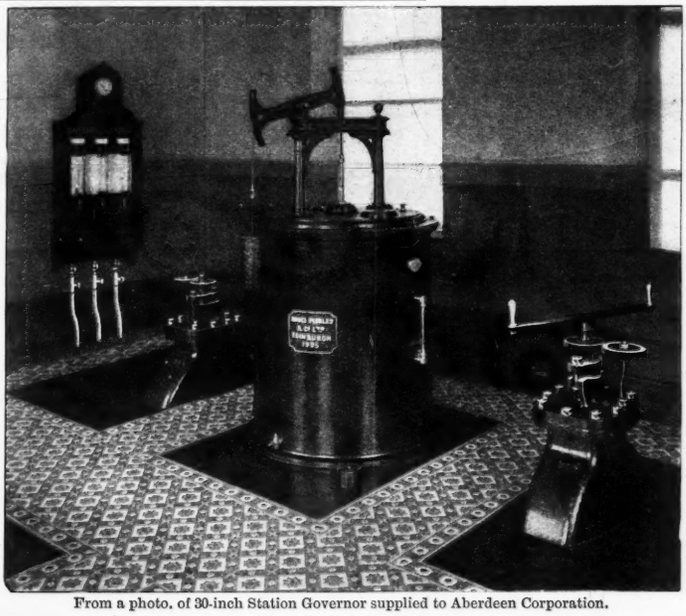

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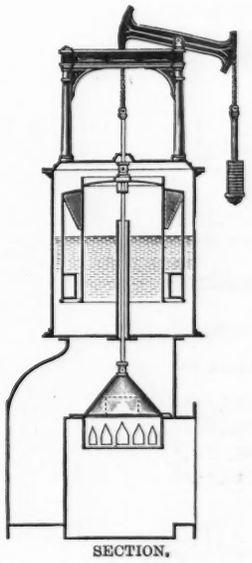

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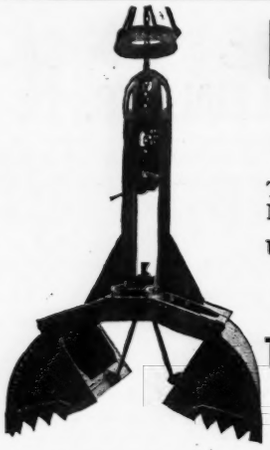

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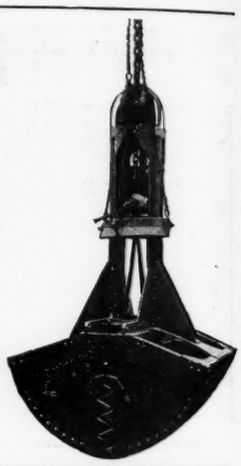

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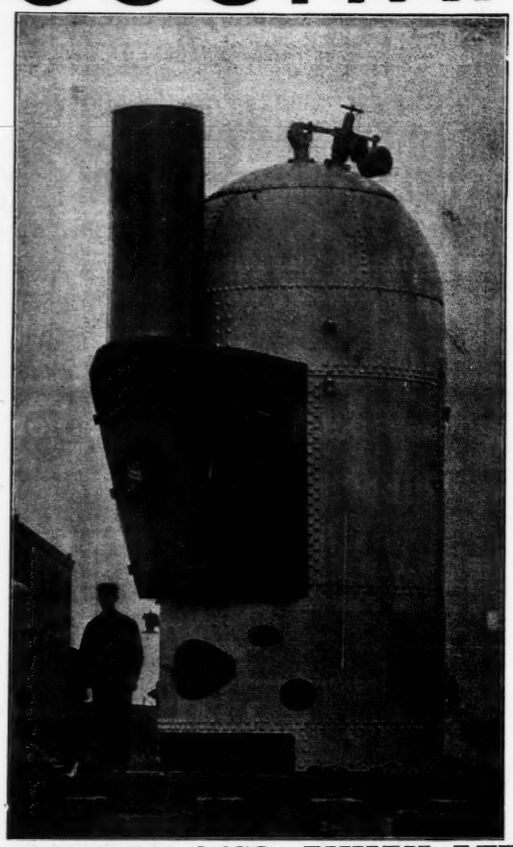

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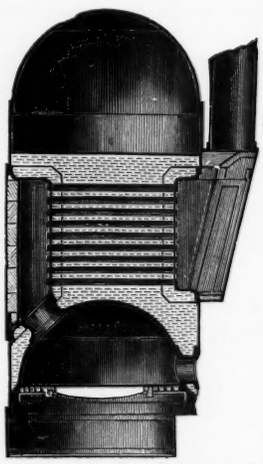

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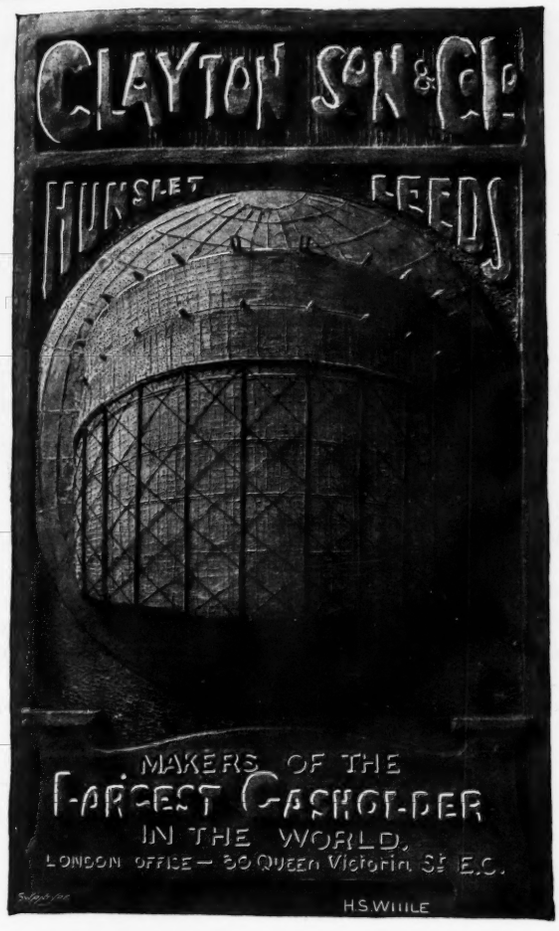

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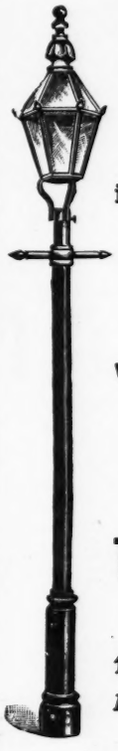

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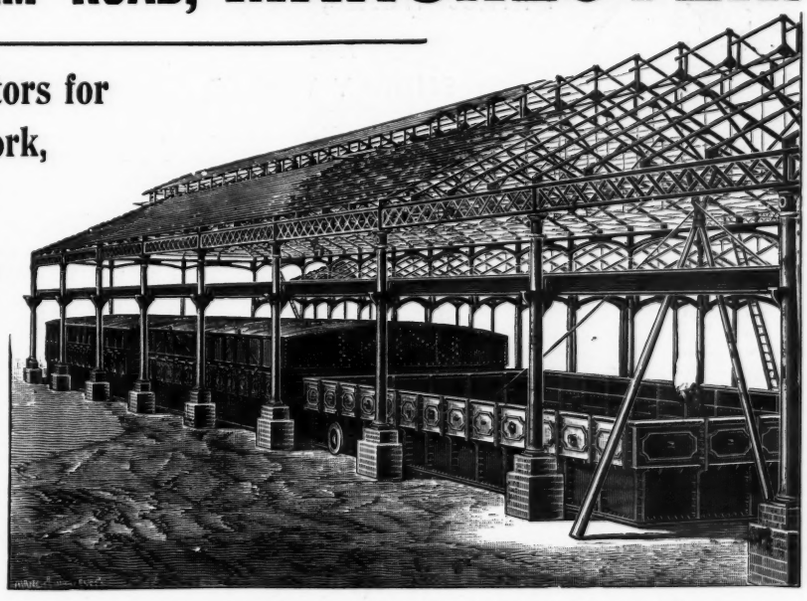

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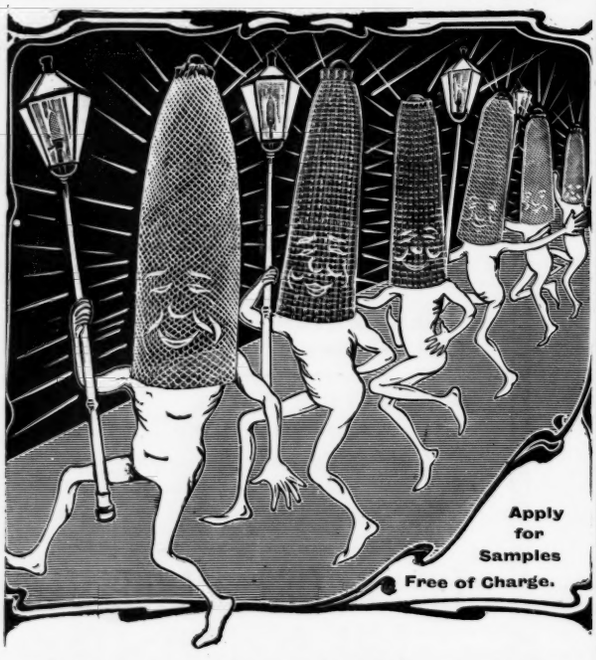

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VOL. XCI. No. 2211.] LONDON, SEPTEMBER 26, 1905. [57TH YEAR. PRICE 6d.

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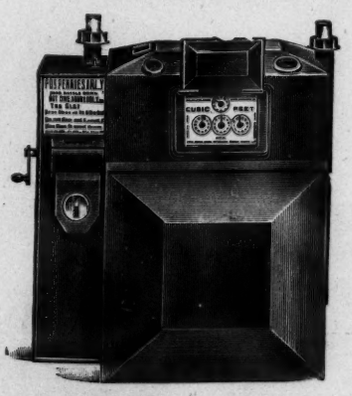
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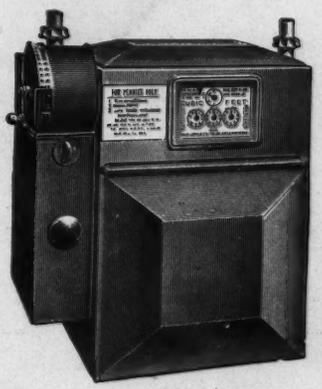
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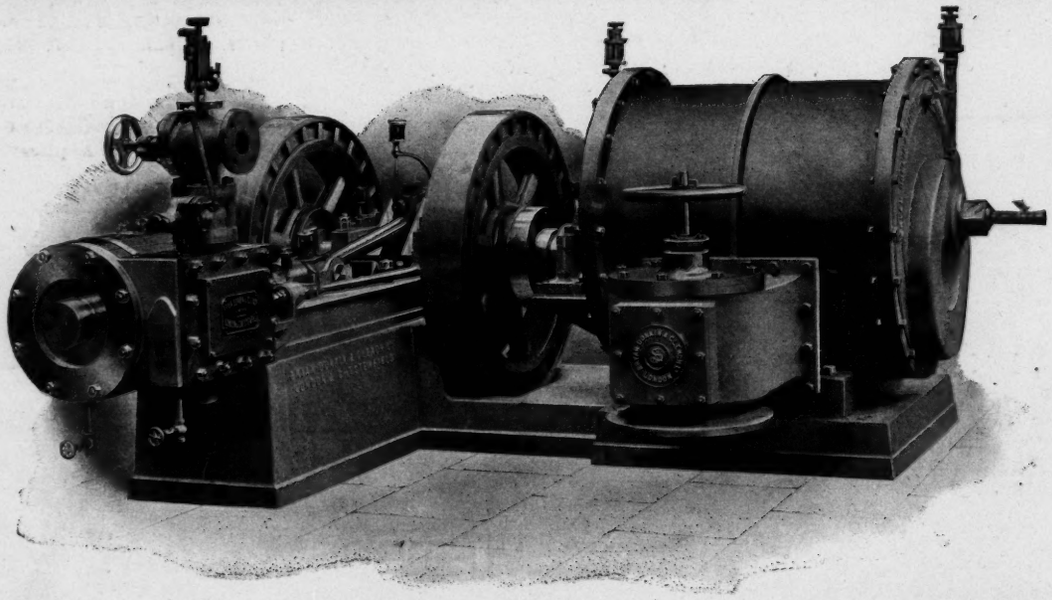

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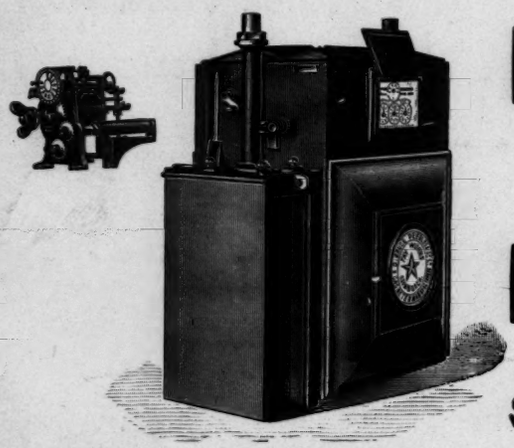

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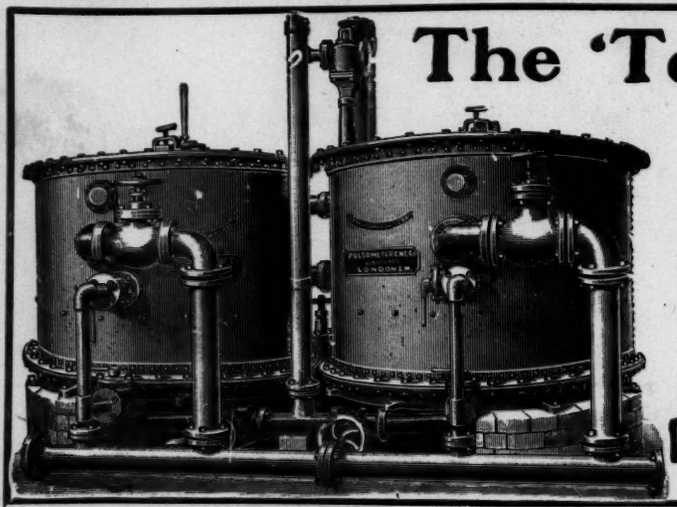

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